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Virtual Working: implications for learning and knowledge creation in Communities of Practice

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A thesis submitted in 2019 in partial fulfilment of the requirements
for the degree of

Doctor of Philosophy

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Declaration

I hereby declare that this thesis has not been and will not be, submitted in whole or in part to another University for the award of any other degree.

George Siantonas

Abstract

Despite the prevalence of virtual communities of practice in most industries, there are relatively few studies examining how situated learning theory plays out in the context of virtual working and this study aims to fill that gap. The conceptual framework is the ontological assumptions that underpin the practice-based view of knowledge on which Lave and Wenger's (1991) concept of a community of practice rest, namely: legitimate peripheral participation, practice and community.

Typically, the term virtual working refers to the use ICT to mediate interactions, (Dubé et al. 2006). However, as well as dependence on ICT, there are other significant factors that determine the degree of virtuality in the way a community operates. These factors include, distributed location, fluid structure and national diversity, (Gibson and Gibbs, 2006). This study has built on the work of scholars such as Cohen and Gibson, (2003) in considering how communities have differing degrees of virtuality based on the degree of dependence on ICT, distributed location, fluid structure and national diversity, referred to above. Each one of these four factors has nuances, which will cause differential effects. Further research (Amin and Roberts 2006; Marabelli, et al., 2013) has examined virtual and distributed communities of practice and raised the issue of the *"the primacy of spatial proximity"* and how *knowledge* and *knowing* (Cook and Brown, 1999; Wenger, 1998) is created and shared when members are not in the same physical space (Dube, et al., 2005). The epistemological assumptions of social constructivist theory hold that people learn and create new knowledge through interactions with others during participation in some form of social practice. This study examines the extent to which the assumptions of this epistemology have implications for learning and knowledge creation when social interaction is mediated through technology and builds on Panteli, et al, (2008) in their work on trust and virtuality, and Panteli, Chamakiotis, et al, (2013) in relation to creativity and virtual working.

The study highlights the complexity which results as the community moves further along the spectrum of virtuality and builds on Amin and Roberts (2008) by introducing a new classification of communities based on the degrees of virtuality prevalent in the community and the differential effects on the means through which knowledge is created and shared. This thesis argues that communities of practice can be considered to be on a spectrum of virtuality, varying between high and lower degrees of co-location and geographical distribution depending on their circumstances.

The research has identified that higher degrees of virtual working require new ways of working that can be encouraged by the development of more formal and explicit protocols that balance the opportunities which virtual working creates by facilitating access to the strength of weak ties (Granovetter, (1973; 1983) on the one hand, with the need to minimise the risk of undermining the fertility of the climate within which learning can flourish by the weakening close social relationships. This extends Ardichvili, Page and Wentling (2003) study on barriers to participation in virtual communities of practice in the Caterpillar Company, which has shown how the organisational culture can affect the extent to which members were motivated to contribute to knowledge sharing. This study argues that these new practices are fundamentally different from the informal codes that facilitate communication in co-located communities, which are largely built on tacit and organisationally specific cultural norms. The new ways of working require a greater degree of codification of information to ensure greater precision and intelligibility in the use of language in order to minimise the possibilities of misunderstandings and balance the absence of facial expressions and gestures, which aid the process of person-to-person communication.

The thesis provides insights into how to cultivate an environment for virtual communities of practice within which knowledge creation can be sustained and increased as well as a detailed empirical account of how actors addressed key challenges for knowledge creation within these virtual communities. Thus the research will be of interest to scholars of situated learning theory and organisational learning, and for practioners and other stakeholders with an interest in the effectiveness of knowledge creation and knowledge sharing in a globalised economic environment within which virtual working is increasingly prevalent.

List of Figures & Tables

Figure/table	Title	Page
Figure 4.3.1	Thesis research design	44
Table 4.5	Steps in the research design	47
Table 4.7.1	Characteristics of communities of practice	50
Table 4.7.2	Title of interviewees	53
Table 4.7.3	Summary of nature of data collected from each case	55
Table 4.7.4	NVivo codes and themes	58
Table 6.2	Classification of CoPs based on stages of virtuality	72
Table 7.1	Steps in the research design	89
Table 7.2	VCoP classification in relation to social ties	91
Table 8.2	Key findings and discussion points	113
Figure 8.5.1a	High degrees of virtual working	125
Figure 8.5.1b	Low degrees of virtual working	125
Table 9.4.1.	Summary of implications of virtual working	142

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I decided to embark on this PhD project at a later stage in my life than is the case with most doctoral research students. Now that the thesis is complete I can reflect on the past four years and conclude that, without doubt, this has been the most challenging piece of work I have ever undertaken in a long career characterised by frequently operating way outside my comfort zone. Therefore it is not surprising that amongst the many emotions I am experiencing I can include a sense of relief and liberation, an emerging feeling of inner peace and some pride, although certainly not with any degree of hubris, more a sense of quiet satisfaction. It is crucial to point out that whilst this is my thesis, I have not been alone in this endeavour. The predominant emotion I feel is the immense gratitude to the many people who have provided me with support and encouragement during the process.

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Table of Contents

Chapter 1.....	1
1.Introduction.....	1
1.1 The increasing prevalence of virtual communities of practice.....	5
1.2 Research questions and research design.....	8
1.3 Overview of remainder of the thesis.....	9
1.3.1 Chapter 2 - Theoretical framework and Literature Review	9
1.3.2 Chapter 3 - Virtual working	9
1.3.3 Chapter 4 - Research approach and methodology	10
1.3.4 Chapter 5 – The case studies	10
1.3.5 Chapters 6 and 7 – Empirical findings	10
1.3.6 Chapter 8 - Discussion	10
1.3.7 Chapter 9 – Conclusions.....	10
Chapter 2 Theoretical framework and Literature Review	11
2.1 Introduction	11
2.2 Theoretical framework.....	11
2.2.1 Community of Practice.....	11
2.2.2 Practice	11
2.2.3 Community.....	13
2.2.4 Legitimate Peripheral Participation	13
2.2.5 Summary of Theoretical Assumptions	14
2.3 Literature review.....	18
2.3.1 Communities of practice	19
Summary of communities of practice	25
2.3.2 Social Ties.....	26
Summary of Social Ties	29
Chapter 3 - Virtual working	30
3.1 Introduction	30
3.2 Definition	30

3.3 Characteristics.....	30
3.3.1 Dependence on technology.....	31
3.3.2 Dispersion.....	31
3.3.3 Diversity.....	32
3.3.4 Nature of membership	32
3.3.5 Spectrum of virtuality.....	33
3.4 Virtuality and social dynamics	33
Summary	37
Chapter 4: Research Approach, Design and Methodology	41
4.1 Introduction.....	41
4.2 Research questions	43
4.3 Research Approach and Research Design	44
4.3.1 Research Approach	44
4.3.2 Research Design.....	44
4.3.2.1 Road map	44
4.5 Steps in Research Design.....	46
4.5.1 Summary	47
4.6 Rationale for Research Strategy	48
4.7.1 Research Setting	49
4.7.2 Selection criteria for the three organisations	49
4.7.3 Selection criteria for the research participants.....	50
4.7.4 Data sources.....	50
4.7.5 Data gathering	51
4.7.6 Overview of participants.....	53
4.7.7 Data collected in each organisation.....	54
4.7.6 Data Analysis.....	56
Use of NVivo	57
NVivo codes and themes	58
4.7.7 Cross-case comparison	58
Fertility of the environment.....	58
Social relationships	59
Degree of virtuality	59
Legitimate Peripheral Participation	59

4.8 Summary	62
Chapter 5 - The case studies	64
5.1 Introduction	64
5.2.1 Case A.....	65
Roles of participants	65
5.2.2 Case B.....	66
Roles of participants	66
5.2.3 Case C.....	67
Roles of participants	67
5.3 Summary.....	67
Chapter 6 Research Findings – Elements of Virtuality and the Fertility of the Learning Environment.....	69
6.1 Introduction	69
6.2 Presentation and interpretation of findings.....	71
6.3 Emergent themes.....	73
6.3.1 Opportunities.....	73
6.3.2 Challenges.....	79
6.4 Summary.....	87
Chapter 7 Research Findings - Strength of social relationships and impact on practice, community and legitimate peripheral participation	88
7.1 Introduction	88
7.2 Classification of virtual communities of practice.....	91
7.2.1 The strength of social relationships	93
7.2.2 The notion of <i>practice</i>	97
7.2.3. The concept of <i>community</i>	101
7.2.4 Legitimate peripheral participation	107
Summary	111
Chapter 8 Discussion.....	112
8.1 Introduction	112
8.2 Synthesis of findings.....	113
8.3 Spectrum of virtuality	118
8.3.1 Higher degrees of virtuality.....	118
8.3.2 Lower degrees of virtuality	119

8.4 Limitations of virtual working.....	123
8.5 Thesis contributions	124
8.5.1 Complexity	124
8.5.2 Development of new protocols	128
8.5.3 Classification of communities of practice	129
8.6 Summary.....	130
Chapter 9 Conclusion	131
9.1 Introduction	131
9.2 Overview of study	132
9.3 Implications for our understanding of communities of practice	136
9.4 Implications of the study for organisations.....	138
9.4.1 Suggestions for organisations with virtual communities of practice	139
9.4.1.1 Strength of Social Ties.....	139
9.4.1.2 Practice	140
9.4.1.3 Community.....	140
9.4.1.4 Legitimate Peripheral Participation	141
9.5 Limitations and opportunities for future research	143
9.5.1 Data collection method.....	143
9.5.2 Single point in time	143
9.5.3 Generalisability	144
9.5.4 Opportunities for further research	144
9.5.5 Possible future research questions	144
References.....	145
12. Appendix	158
12.1 Interview transcripts	158

Chapter 1

“What are the implications of virtual working from your perspective?”

“Virtual working means you are missing the physical connection and missing the ‘hug’ which can be the glue to the cohesiveness of a community and this may inhibit confidence in others and trust building can be more difficult. Also, the fact that people are in different places makes it difficult to generate the sense of togetherness – especially as social gatherings are limited.”

(Quote from an interview with a senior consultant in a Professional Institution)

Section 1 of this chapter provides an introduction and overview of the research and explains that the thesis examines the implications of virtual working for the way in which knowledge is created and shared in communities of practice.

Section 1.1 examines the drivers of the increasing prevalence of virtual communities of practice (VCoPs) and the implications of this for companies and other work based organisations.

Section 1.2 sets out the research questions and the research design deployed to address the questions.

Section 1.3 provides a brief outline of the rest of the succeeding chapters.

1.Introduction

The focus of this study is to investigate the effects of virtual working on knowledge creation and the nature of social relationships in communities of practice. The research also examines the implications for the socialisation of new members and for the notion of practice and the concept of community. Digital technology is facilitating new forms of creating knowledge within and between organisations such multi-national firms, professional institutions, governmental and non-governmental bodies. People are increasingly working in a distributed way and using technology to mediate their interactions. As a result communities of practice are forming across space and time.

Whilst technology has made it possible for communities to interact remotely, truly effective knowledge creation and knowledge sharing is not just about access to the most advanced technology, but also about the ability to construct shared dialogues, identities, stories and jargons that underpin new practices and at the same time work around cultural and language differences. The thesis argues that despite the prevalence of virtual communities of practice in most industries, there are relatively few studies examining how situated learning theory plays out in the context of virtual working. This means that there is a need to undertake research into how these new wave developments in technology impact on learning as a function of social relationships. The thesis examines the issue of whether social interactions mediated through technology are capable of providing a sufficient platform to develop mutual engagement, sense of joint enterprise, and a shared repertoire of communal resources necessary for knowledge creation in virtual communities of practice.

Lave and Wenger (1991) studied situated learning in co-located communities of practice in real-time. Further research (Amin and Roberts 2006; Marabelli, et al., 2013) has examined virtual and distributed communities of practice and raised the issue of the “*the primacy of spatial proximity*” and how *knowledge* and *knowing* (Cook and Brown, 1999; Wenger, 1998) is created and shared when members are not in the same physical space (Dube, et al., 2005). Since the knowing generated in a Community of practice is considered to be embedded in a specific organisational context (Lave and Wenger, 1991), the sharing of this knowledge in a distributed context is especially problematic. The epistemological assumptions of social constructivist theory hold that people learn and create new knowledge through interactions with others during participation in some form of social practice. Moreover, situated learning plays a critical part in the reproduction and transformation of practice. The research examines the extent to which the assumptions of this epistemology have implications for learning and knowledge creation when social interaction is mediated through technology. The study draws upon situated learning theory in order to bring new insights into how virtual working impacts on the capacity of communities to form and maintain relationships that underpin the creation and sharing of knowledge – much of which is tacit. The fact that virtual working places greater emphasis on distributed communities on the basis of geography, time, language and culture, makes this particularly challenging for companies and other work based organisations.

Lave and Wenger (ibid) have rooted the generation of knowledge in the context of social relationships – in situations of collective endeavour and co-participation. Lave and Wenger argue that it is social engagements that provide the proper context for learning to take place’ (1991: 14) rather than cognitive processes and conceptual structures. Learning involves participation in a community of practice and participation *“refers not just to local events of engagement in certain activities with certain people, but to a more encompassing process of being active participants in the practices of social communities and constructing identities in relation to these communities”* (Wenger 1999: 4). By being able to observe and engage in initially basic and then increasingly more complex tasks the newcomers develop skill and mastery and take up a more central and active role and finally participate fully in the community. This is the process by which newcomers learn - through participation in the sociocultural practices of a community that starts with **observation**. This has significant implications for virtual communities since, if the process starts with **observation**, how can this be achieved when the community is geographically and temporally dispersed and social interaction is mediated through technology across geographical and cultural boundaries?

This thesis has examined these challenges and in studying how virtual working impacts on communities of practice makes a contribution to situated learning theory by considering the implications of virtual working in relation to the effect on the overall environment for learning and knowledge creation; the importance of strong social relationships and the consequential implications for the socialisation of new members Legitimate peripheral participation. Furthermore, the thesis provides insights into how to cultivate an environment for virtual communities of practice within which knowledge creation can be sustained and increased as well as a detailed empirical account of how actors addressed key challenges for knowledge creation within these virtual communities. Thus the thesis will be of interest to scholars of situated learning theory and organisational learning, and for practioners and other stakeholders with an interest in the effectiveness of knowledge creation and knowledge sharing in a globalised economic environment within which virtual working is increasingly prevalent.

The research draws on virtual communities of practice from different organisations, within which virtual working is prevalent. Data has been collected through semi-structured interviews conducted with members of the virtual communities of practice in the study and has been analysed thematically. The analysis is presented in three separate themes, which unpack the extent to which the elements of virtuality (dependence on ICT, geographical and temporal distribution, national, cultural and language diversity) impacts on:

1. The fertility of the environment and its conduciveness to knowledge creation
2. The importance of strong social relationships in relation to knowledge creation
3. How the importance of strong social relationships influences the effectiveness of the socialisation of new members (Legitimate Peripheral Participation)

1.1 The increasing prevalence of virtual communities of practice

There is a significant body of literature addressing the topic of virtual working in the initial wave of the development of digital technology when the emphasis was on making the codification, storage and retrieval of knowledge more efficient, (Accenture, 2014) and with most studies focused on open source communities, (West & Lakhani, 2008). More recent developments in digital technology have focused on collaboration and as a result, social interactions are now increasingly characterised by the use of e-mail, VOIP, videoconferencing and social media. However, there has been relatively little research into how these new wave developments in technology impact on learning as a function of social relationships. This raises the issue of whether these types of relationships are capable of providing a sufficient platform to develop mutual engagement, a sense of joint enterprise, and a shared repertoire of communal resources necessary for knowledge creation in virtual communities of practice when social interaction is mediated through technology. Virtual working does not necessarily preclude all face-to-face interaction. However, several factors, including geographical and temporal dispersion, pressures of busy schedules and the financial and environmental impact of travel are all contributing to making virtual working more prevalent. As a result, the rapid development of digital technologies has facilitated the widespread search for greater flexibility to incorporate more diverse groups of people in knowledge creation. Associated with this is the prevalence of remote working, which is inhibiting regular engagement in co-located communities of practice and contributing to the formation of virtual communities of practice as a result, (Murillo 2006). This means that knowledge is being increasingly developed within groups of people who interact in a virtual and distributed way. This highlights important issues regarding the nature of practice when it is disassociated from geographical space and face-to-face contact.

Digital technology allows people within distributed communities to build and maintain relationships between people in the same network. However, the consequence of the use of technology seems to be that people can now have access to far wider networks of people than is available for co-located groups. The studies by numerous writers, (e.g. Memmi, 2006; Kimble and Hildreth, 2005; Murillo 2006; Dubé et al. 2006; Correia et. al. ,2009) show how VCoPs can consist of many more people than co-located communities and relations between members tend to be casual and informal.

The study undertaken by Marabelli, Rajola, Frigerio and Newell (2013), shows how group membership in virtual communities can be goal-oriented, project based, temporary, with a group structure that evolves rapidly. Their research highlights how virtual working can facilitate the informal interaction between people to generate new knowledge. In many cases members are geographically separate, may never get to know each other and yet share common or similar work, (Kimble and Hildreth, 2005).

Further studies have shown how virtual communities of practice (VCoPs) can perform a central role in promoting collaboration between members who are dispersed in both time and space. In many cases the communities consist of distributed members of one organisation, although there is an increasing tendency for the community to become a vast virtual platform, where partners, customers, suppliers and the organisation could meet and learn, (Dubé et al. 2006). Bates (2014) has argued that digital technology has contributed to a working environment that is more volatile, complex, uncertain and ambiguous than before and in this work context VCoPs can be very effective in creating and sharing knowledge. These communities are characterised by infrequent interactions, temporary membership, large numbers of people, and little identification with the group as a whole. (Memmi, 2006). Furthermore, they tend to identify with an idea or goal, rather than relate to a group of people in a physical location. The balance of the arguments in the literature emphasises that virtual working is contributing to the formation of flatter, more flexible, temporary groups within and beyond the boundaries of organisations and allowing people to coalesce around common aims and shared goals with associated benefits in the creation of knowledge. This raises some profound questions regarding the notion of *community* and how it should be defined in the context of virtual working. Firstly, does virtual working enable individuals to interact and create knowledge with less emphasis on strong ties, prescribed relationships and the associated degree of hierarchy embedded in our understanding of the notion of community? Secondly, does virtual working mean that the sharing of common goals has primacy over social relationships in respect of learning and knowledge sharing?

Globalisation has affected many organisations and, as many writers have commented, has had significant consequences for the nature of work. As a result there are many studies that look into how, in order to work effectively in an international setting, companies are increasingly turning to transnational virtual communities of practice, (Panteli & Chiasson, 2008; Lipnack and Stamps, 1999; West 1997). These are seen as an effective and flexible means of bringing both skills and expertise to bear on specific problems. However, a critical aspect of virtual communities of practice, which remains relatively unexplored, is how the theory of situated learning and the associated importance of strong social ties plays out in the context of virtual communities of practice. Working in a distributed environment has an effect on informal collaboration and knowledge sharing and moreover, working in a more internationalised context means that virtual communities of practice have to cope with geographical distance, as well as time, culture and possibly language differences.

Despite the critical role played by virtual communities of practice in knowledge creation and knowledge sharing, there is a lack of literature explicitly examining the impact of virtual working on the three key epistemological assumptions of a community of practice, namely: legitimate peripheral participation, practice and community. This study aims to fill this gap by unpacking the extent to which virtual working influences knowledge creation activities in the virtual communities of practice under study.

1.2 Research questions and research design

The objective of this thesis is to advance the rather limited understanding of the implications of virtual working for the theory of situated learning. To achieve this the thesis addresses these research questions:

RQ1. What are the implications of virtual working for the existence of a learning environment conducive to knowledge creation in communities of practice?

RQ2. What are the implications of virtual working for the importance of strong social relationships with regard to learning and knowledge creation in communities of practice?

Sub Questions

How does the importance of the strength of social relationships influence:

- *Legitimate peripheral participation*
- *The development of practice*
- *The sense of community*

The research follows a qualitative case study approach and the data has been collected through semi-structured interviews conducted with members of the virtual Communities of practice in the study. The analysis of the data follows the 'explanation building' technique (Yin, 2009).

Section 1.3 provides an overview of the remaining chapters in the thesis.

1.3 Overview of remainder of the thesis

The remainder of this thesis is organised as follows:

1.3.1 Chapter 2 - Theoretical framework and Literature Review

This chapter provides the theoretical framework that will guide the analysis, and reviews the literature in the fields of communities of practice, social capital and social ties, situated learning, tacit and explicit knowledge.

1.3.2 Chapter 3 - Virtual working

This chapter reviews the relevant literature on virtual working and provides a definition and of virtual working of the term as well as presenting key characteristics of virtual communities of practice.

Both chapter two and three set out a comprehensive review of literature in these interconnected areas of research and provide the basis for the study to examine whether the line between digital relationships and more traditional, co-located relationships is beginning to blur as people form larger networks and perhaps more superficial online relationships. Furthermore, is the increasing prevalence of virtual working leading to weaker social ties between members of communities of practice with associated challenges and opportunities for learning and knowledge creation in global organisations?

1.3.3 Chapter 4 - Research approach and methodology

This chapter sets the stage for how the research questions will be addressed. The chapter also explains and justifies the research design and the rationale for the choice of case study as the strategy, the selection of the cases, the data collection methods, operationalisation of the theoretical concepts and an explanation of the data collection and analysis approaches. The research will draw on communities of practice from three different organisations, within which virtual working is prevalent. Data has been collected through semi-structured interviews conducted with members of the virtual communities of practice in each of the three cases in the study.

1.3.4 Chapter 5 - The case studies

This chapter presents an overview of each of the three cases together with an explanation of the nature of the communities of practice and the type of technologies used together with examples of virtual working in which the members engaged.

1.3.5 Chapters 6 and 7 - Empirical findings

These chapters present the research findings in relation to each of the research themes and describes how the analysis unpacks the extent to which knowledge creation activities are influenced by the different elements of virtuality, namely, dependence on ICT, geographical and temporal distribution, national, cultural and language diversity.

1.3.6 Chapter 8 - Discussion

Chapter eight presents a discussion of the insights that arise from the empirical findings as well as links to the literature and sets out the contributions made by the study.

1.3.7 Chapter 9 - Conclusions

This chapter summarises the thesis and provides some implications for organisations that have relevance to practioners and other stakeholders with an interest in the effectiveness of knowledge creation and knowledge sharing in a globalised economic environment within which virtual working is increasingly prevalent.

Chapter nine also sets out the limitations of the research and provides suggestions for further study in the form of some proposed further research questions.

Chapter 2 Theoretical framework and Literature Review

2.1 Introduction

This chapter presents the explanations of the theoretical concepts which provide the framework for the study and which form the basis of literature review.

2.2 Theoretical framework

This section provides definitions of the term “virtual working” followed by explanations of the terms “Community of Practice”, Legitimate Peripheral Participation, ‘Practice’ and ‘Community’.

2.2.1 Community of Practice

Lave and Wenger’s (ibid) concept of a Community of Practice places a significant emphasis on the need for a fertile environment fed by the ‘nutrients’ of strong social relationships in the creation of knowledge. Lave and Wenger’s (ibid) original theory of situated learning states that knowledge is co-constructed, situated in a specific context and embedded within a particular social environment. This is built on notions of “knowledge construction” that emphasises agency.

As such, the focus is on how people encounter each other on a regular basis and how they use language to construct their world and how these encounters can transcend the structures imposed by the immediate boundaries of the organisations within which they work. Lave and Wenger’s studies focused on communities of practice characterised by co-location, where physical proximity is a necessary requirement for the sharing of knowledge because it is developed within a common context much of which is tacit. Members of a Community of Practice share a profession or endeavour (domain). This domain leads to the development of a body of common knowledge – known as the practice – and as fellow practitioners, members are able to develop a shared repertoire of resources: experiences, stories, tools and ways of addressing recurring problems.

2.2.2 Practice

This can be described as the ways of doing things that are shared among members.

A practice forms when people coalesce to *“participate in an activity system (practice) about which participants share understanding concerning what they are doing and what that means in their lives and for the community”*(Lave & Wenger, 1991; Wenger, 1998). Those that engage in the practice form a group of *“people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis”* (Wenger et al., 2002,). In this sense practice is generally work-related, focusing on a professional activity, skill, or topic (McDermott, 2000a).

Engagement in practice is the vehicle for learning and, in turn, learning is one of the consequences of that engagement. The common theme emerging from these studies is the strong social and collaborative element in the way in which knowledge is developed and the associated requirement for strong social relationships to exist between members engaged in the practice.

2.2.3 Community

Practitioners have a sense of shared community with the associated implications of strong sense of belonging and common identity and overlapping values. This emphasises the interconnectedness between individual learning and the social context and highlights how important social relationships are as a means of knowledge creation and learning (Nahapiet and Ghoshal, 1998). The community is made up of members, who engage in collective activities, support each other and share information. This acts as a fertile breeding ground for problem solving, creativity and knowledge creation. The nutrients of this fertility are the social relationships that are formed, the rapport, trust and reciprocity established and this, in turn, enables them to learn from each other. These factors mean that communities of practice contribute to learning by enhancing innovation in organisations through encouraging the creation and sharing of knowledge both at an organisational and group level. Moreover, they contribute to the diffusion of tacit knowledge by working together, using common language, stories and jargon, sharing a set of common set of values and a sense of communal identity, (Bettiol and Sedita, 2011).

2.2.4 Legitimate Peripheral Participation

Legitimate Peripheral Participation is the informal way of learning by observation - as it were by osmosis - and enables new members to move from the periphery to the centre and assume their role as legitimate members of the community. Lave and Wenger (ibid) describe Legitimate Peripheral Participation as a two-way bridge between the development of knowledge, skill and identity - the production of persons - on the one side and the production and reproduction of communities of practice on the other:

“Newcomers become old-timers through a social process of increasingly centripetal participation, which depends on legitimate access to ongoing community practice. Newcomers develop a changing understanding of practice over time from improvised opportunities to participate peripherally in ongoing activities of the community and knowledgeable skill is encompassed in the process of assuming an identity as a practitioner, of becoming a full participant, an old-timer.” Lave and Wenger (ibid).

Therefore, Lave and Wenger have rooted the gaining of knowledge in the context of social relationships – in situations of collective endeavour and co-participation. The key factor is that learning occurs in the work place rather than in the classroom and as is *“far more a question of socialisation than of formal learning”* (Trowler and Turner 2002:242).

2.2.5 Summary of Theoretical Assumptions

A Community of Practice is a social locus for learning in practice, (Lave and Wenger, 1991; Brown and Duguid, 1991; Wenger, 1998). Lave and Wenger’s (1991) concept of a community of practice places much emphasis on the need for strong social relationships in the creation of knowledge. Their original theory of situated learning states that knowledge is co-constructed, situated in a specific context and embedded within a particular social and physical environment with a high degree of co-location and strong social relationships and this was an important feature of many of the case studies in which studies of community of practice took place.

However, digital technology is facilitating new forms of creating knowledge within and between organisations such multi-national firms, professional institutions, governmental and non-governmental bodies. People are increasingly working in a distributed way and using technology to mediate their interactions. As a result communities of practice are forming across space and time. It is clear that advances in technology allow communities of practice to increasingly interact in a virtual and distributed way with less need for co-location. Virtual working poses challenges not usually encountered when groups of people work in the same building. Examples include the constraints (and advantages) of time zones; lack of non-verbal cues; cultural differences between members and problems of trust and identity. Moreover, as Kimble and Barlow (2004) claim, *“Virtual working often results in the need to share work-in-progress with others, which may require members to adopt new attitudes and new mindsets towards work.”* Kimble and Barlow (ibid) argue that developing a common culture and communication procedures are essential for the development of credibility and trust among members in a virtual environment. To be effective, members in virtual communities have to develop new ways of sharing knowledge and understanding in the electronic space.

The increasing prevalence of virtual working means the nature of communities of practice is changing from of a largely co-located group with a higher degree of physical proximity and associated strong social relationships to groups of people relying on ICT to mediate their interactions and working with varying degrees of virtuality. As a consequence work activities are far more dispersed and organisations are much more regionally fragmented than was hitherto the case. This could have the effect of weakening the social relationships that are a requirement for learning and knowledge creation in co-located communities whilst at the same time opening up new pathways for learning to take place. The research design enables the study to examine the implications of virtual working for the theoretical assumptions which underpin the practice based view of knowledge on which Lave and Wenger's (ibid) concept of a Community of Practice rest, namely the need for a fertile learning environment fed by the nutrients of strong of social relationships characterised by closeness, frequency of interaction and duration with the associated features of trust, reciprocity, communication and conflict management. The research design also allows for an examination of the implications on the associated elements of a community of practice, namely, legitimate peripheral participation the notion of 'practice' and the notion of 'community'.

Lave and Wenger's (1991) concept of a community of practice places much emphasis on the need for strong social ties in the creation of knowledge. Lave and Wenger's (ibid) original theory of situated learning states that knowledge is co-constructed, situated in a specific context and embedded within a particular social and physical environment. Indeed this was the case in many of the case studies of community of practice authors (1991) including Lave and Wenger's examples (1991), the Xerox engineers, who regularly shared anecdotes about the copiers they repaired in the field (Orr, 1991, Brown & Duguid, 1991) and the master flute makers described by Cook & Yanow, (1993). The initial studies focused on craft based communities each of which are associated with activities that require a high degree of skill and knowledge in relation the nature of endeavour in which the members of the community are engaged. These communities of practice are characterised by co-location where physical proximity is a necessary requirement of the sharing of knowledge, much of which is tacit as opposed to explicit. Many of these communities of practice are also associated with small-scale activities and historically with the use of the terms *artisan* or *tradesman*. Rather than considering learning and knowledge creation to be associated merely with the acquisition of

information, each of these studies place learning and knowledge creation within the context of situated social relationships. Indeed, the process whereby new members of the community of practice are socialised, which Lave and Wenger (ibid) name legitimate peripheral participation, is described as a social process through which newcomers move from the periphery of the community of practice to full participation. This process requires collective collaboration between 'master' and 'apprentice' in co-located environments.

However, in the years following these initial studies scholars (e.g. Brown & Duguid, 1996; Stewart, 1996) began to consider how the concept could be applied within more dynamic contexts found in the commercial environment. These later studies identified that the business environment was characterised by many different forms of communities in addition to the craft based ones referred to in those initial studies.

For example, Wenger's (1998) study of insurance company claims operatives emphasised the relevance of the concept to businesses and since then several other authors have highlighted how the concept can be applied to commercial organisations, (e.g., Fontaine & Millen, 2004; Lesser & Storck, 2001). This raises two interesting questions. Firstly, do communities of practice that are not task related or craft based require the same degree of strength of social ties as those communities of practice that were the subject of Lave and Wenger's 1991 work? Secondly, since a common feature of all the aforementioned studies is that they have focused on co-located communities, (Kimble & Hildreth, 2005), what is the effect on social ties when communities of practice are distributed across space and time and are not co-located? These issues are raised by Amin & Roberts (2008), who question whether effective social dynamics always require the strong social ties needed by the craft-based communities studied by Lave & Wenger, Orr and Cook & Yarrow, (ibid). Amin and Roberts (ibid) argue that different Communities of practice demonstrate different types of social interaction and only craft/task based CoPs require on-going physical proximity between members (ibid). Dube'et al, (2005) also examined how knowledge is created and shared when members are not in the same physical space. Their exploratory study of 14 commercial organisations claimed that they were able to form communities of practice without the need for constant face-to-face contact by taking advantage of ICT and the internet, thereby arguing that advances in technology allow communities of practice to increasingly interact a virtual and distributed way with less need for co-location.

So the question arises; does virtual working mean that the strong social ties associated with physical proximity are not always a necessary or even useful, requirement, for knowledge creation?

At this point it is important clarify what social ties are and how they can be defined. Social ties are the connections between individuals and the strength and depth of the connection. Their strength can be assessed according to the amount of time spent together, the emotional intensity of the relationship, the level of intimacy and the degree of reciprocity (Granovetter, 1973; 1983).

These ties are typically broken into two major categories: weak ties – describing connections between people who do not know each other or, at least, are considered acquaintances, and strong ties – connections between such as close friends, community and family members. As Granovetter, (1973; 1983) explains, strong ties in a network typically mean that people are closer to each other than two individuals connected by a weak tie. He defines weak ties as social relationships typified by infrequent contact, short history, and limited relational closeness. His theory of the strength of weak ties argues that weak ties are especially useful for learning because they facilitate access to socially distant pockets of information, which can stimulate the process of generating knowledge. This view chimes with Burt's emphasis (2001) on network structures and structural holes, which posit that weaker ties and looser, less dense connections can stimulate a greater degree of new ideas and learning through providing opportunities to connect and make new ties with those outside one's immediate community.

Social ties are closely associated with the notion of social capital and as such they can be considered to be a social resource or asset, (Narayan and Pritchett, 1997). Communities with strong social ties have a higher level of social capital and are characterised with regular interaction, which encourages reciprocity, (Coleman, 1991). Moreover, higher degrees of social capital contribute to patterns of behaviour through which people are more prepared to trust each other, collaborate and engage in the process of knowledge creation and knowledge sharing. Putnam (2000) also argues that that a higher degree of social capital facilitates the resolution of collective problems by establishing norms of behaviour to which members conform.

As a result trust is easier to establish and this in turn reduces the ‘transaction costs’ and opportunism in relationships. As argued by Dyer and Chu, (2003): *“a high level of trust critically reduces transaction costs by minimizing conflict, unnecessary bureaucratic control and administrative expenditures, time and energy”*.

The concept of social capital emphasises the advantages of strong social ties that lead to density in networks and encourages norms and ways of working which allow the more complex problems that require closeness to be tackled. This raises the question of whether virtual working can contribute to generating the degree of community social capital necessary for dealing with more intricate issues in the way that physical proximity and co-location does.

Despite the fact that there are many studies, which examine how a community-based approach contributes to learning, there is a lack of literature that specifically uses the lens of virtual working to examine the relationship between social relationships and knowledge creation and knowledge sharing within communities of practice. This thesis aims to address this gap. The objective of this study is to unpack the communities of practice concept and to analyse the implications of virtual working on:

1. The importance of the strength of social ties in communities of practice
2. The notion of *practice*
3. The notion of *community*
4. The process of legitimate peripheral participation

Each of these points will be empirically tested in the research setting.

2.3 Literature review

This section reviews the literature on communities of practice and social ties.

2.3.1 Communities of practice

The community of practice is considered to be *'one of the most influential concepts to have emerged within the social sciences during recent years'* (Hughes et al. 2007). The concept evolved from the ground-breaking work by Lave and Wenger (1991) on situated learning and has been described as a social locus for learning in practice, (Brown and Duguid 1991; Lave and Wenger, 1991; Wenger, 1998). Lave and Wenger described how Communities of practice emerge when an informal group of people coalesce to *"participate in an activity system (practice) about which participants share understanding concerning what they are doing and what that means in their lives and for the community"* (Lave and Wenger, 1991; Wenger, 1998). Their underpinning assumption is that people learn through social interaction and that the concept of Community of practice is, in effect, an architecture which provides a structure within which learning occurs and knowledge is created.

Wenger (2000) argues that a Community of practice is different from a community of interest or a geographical community in that it involves a shared practice: ways of doing things that are shared to some significant extent among members.

Lave and Wenger's initial notion of community was a development of the social science literature that began to focus on the concept of community from the early years of the 20th century. C. J. Galpin (1915) used the word when writing about how to identify rural locations in terms of the trade and service areas surrounding a central village (Harper and Dunham 1959). After this time, scholars began to develop several competing definitions of community. Some used the word in relation to a geographical area; some focused on a group of people living in a particular place; and others considered the term to relate to an area of common life. A significant value of the notion of community within the Community of practice concept lies in the fact that it identifies a social grouping not in relation to shared abstract characteristics (e.g. class, gender) or simple co-location (e.g. neighborhood, workplace), but in virtue of shared practice. In the course of regular joint activity, a Community of practice develops ways of doing things, views, values, power relations and ways of talking.

Lave and Wenger used the word community as one of the three key elements embodied in the concept and made assumptions as to the co-located nature of the community. These three elements are critical in differentiating a Community of practice from other types of groups. The domain - a shared domain of interest, values and competencies with other members. The community - members engage in collective activities, support each other and share information. As a result relationships are formed, rapport and trust is established and this, in turn, enables them to learn from each other. The practice – as fellow practitioners, members are able to develop a shared repertoire of resources: experiences, stories, tools, ways of addressing recurring problems—in short a shared practice, their domain. Lave and Wenger (1991:98) explain that Communities of practice are rooted in Situated Learning and being a Community of practice member involves building and sustaining relationships over time and sharing common values, (Wenger 1998). The element of the domain and the community within which they apply themselves gives each member a sense of collective endeavour and belonging.

This relates in some approaches to the use of the word community referred to above. Lave and Wenger link the notion of community to that of learning and the development of knowledge. As such, they take a social constructivist approach on learning and knowledge arguing that learning takes place through interactions and conversations between people and hence knowledge is generated, (Easterby-Smith et al., 2000:787). Lave and Wenger (1991:98) argue that knowledge transformation is fundamentally influenced by the creation of social learning spaces (Cooper and Burgoyne, 2000). As a result of this cooperation, members of the community of practice have a close bond with each other and this in turn facilitates the fostering of effective relationships based on trust, which they consider to be one of the key attributes of the development of an effective community. Hence the use of the word community – where situated learning takes place in an essentially informal way and largely in situ, rather than in the classroom. Lave and Wenger argue that this is the process which drives the creation of knowledge and that *“learning is a social and participative activity”* as opposed to a consequence of cognition. Moreover, Lave and Wenger assert that *“learning is an integral part and inseparable aspect of social practice”* and that learning occurs through interactions with other people undertaking common activities in a particular social context. Lave and Wenger concluded that learning is as much

about understanding how to behave as what to do – once again introducing elements of Community - *“a way to emphasize that every practice is dependent on social processes through which it is sustained and perpetuated, and that learning takes place through the engagement in that practice”*, (Gherardi, Nicolini and Odela 1998: 279).

Key to Lave and Wenger’s concept of a community of practice is the process by which a newcomer learns from others in the group - legitimate peripheral participation. Lave and Wenger describe this as a two-way bridge between the development of knowledge, skill and identity - the production of persons - on the one hand and the production and reproduction of communities of practice on the other. *“Newcomers become old-timers through a social process of increasingly centripetal participation, which depends on legitimate access to ongoing community practice. Newcomers develop a changing understanding of practice over time from improvised opportunities to participate peripherally in ongoing activities of the community and knowledgeable skill is encompassed in the process of assuming an identity as a practitioner, of becoming a full participant, an old-timer”* Lave and Wenger (1991).

Lave and Wenger have rooted the gaining of knowledge in the context of social relationships – in situations of collective endeavour and co-participation and argue that it is social engagements that provide the proper context for learning to take place’ (1991: 14) rather than cognitive processes and conceptual structures. Learning involves participation in a community of practice and participation *“refers not just to local events of engagement in certain activities with certain people, but to a more encompassing process of being active participants in the practices of social communities and constructing identities in relation to these communities”* (Wenger 1999: 4). By being able to observe and then engage in initially basic and then increasingly more complex tasks the newcomers develop skill and mastery and take up a more central and active role and finally participate fully in the community. This is the process by which newcomers learn - through participation in the sociocultural practices of a community that starts with observation. This has significant implications for virtual communities since, if the process starts with observation, how can this be achieved when the community is geographically and temporally dispersed and social interaction is mediated through technology across geographical and cultural boundaries?

Moreover, the phenomenon of lurking, remaining on the edge of the community and benefiting from the knowledge but not contributing, is considered to be a form of legitimate peripheral participation (Wenger 2000). The extent to which this engenders weaker links for online communities and any associated challenges and opportunities for situated learning and knowledge creation is a key theme of my research. Brown and Duguid's (1991) example of how informal groups form to improvise solutions to problems when faced with challenges in their work clearly refers to a co-located group.

Building on Orr's ethnographic study of Xerox engineers, *'Talking About Machines'* (1990), they explain what happens when canonical accounts are too rigid and therefore likely to be ineffective in new and dynamic environments. They moved beyond Lave and Wenger's approach and put forward three overlapping elements to explain how the Xerox engineers were able to solve problems. These are: narration, collaboration and social construction. Through narration they were able to articulate stories about particular machines.

These 'war stories' encompassed the context in which the machine operated and gave a more meaningful description of what was happening than the official service manual and one that could be acted upon by others encountering a similar problem. Through collaboration the engineers themselves worked together collectively and spontaneously as an informal team. By sharing experiences they were able help each other to solve problems they each had encountered in the field. A particularly interesting fact about this was that this took place despite the fact that the Xerox Corporation viewed the job as an essentially solitary occupation with limited opportunities for socialising. The third category of social construction can be identified in two ways. Firstly, the engineers created a common understanding – their own shared 'map' of the machines. Secondly, through developing his or her individual narration skills each engineer created a unique identity and contributes to the collectively held knowledge base of the Community of practice. Whilst this example is a powerful explanation of social learning in action it is focused on a co-located community.

Lave and Wenger's initial work (1991) was focused on five cases covering craft or task based activities undertaken by Yucatec midwives, Vai and Gola tailors, naval quartermasters, meat cutters and non-drinking alcoholics. Orr's ethnographic study (1990) focused on the community of Xerox engineers.

Each of these groups was characterised by co-location and strong social ties between the members. The study by Cook and Brown (1999) extends Iave and Wenger's work and argues that the learning and knowledge development of an individual in an organisation is, in large measure, dependent on the social environment. Moreover, the social environment is in turn influenced by the knowledge held by the individuals within the social environment. This interconnectedness between individual learning and the social context highlights how important social relationships are as a means of knowledge creation and learning (Nahapiet and Ghoshal, 1998). They put forward the view that this is because learning is, to a large extent, the outcome of collaborative processes that occur in communities based upon personal relationships strong enough to allow for free and trustful information exchange (Wenger, 2000). The common theme emerging from these studies is the strong social and collaborative element in the way in which knowledge is developed and the associated requirement for strong social ties to exist between the members.

In contradiction to the thrust of the studies referred to above, Amin and Roberts (2008), challenge how the notion of communities of practice has evolved. Amin and Roberts (ibid), argue that the communities of practice concept as described by the earlier works has become an umbrella term that does not contemplate all the social varieties of knowing in action. They conducted an extensive review of the literature describing situated social practice, learning and knowing. As a result, they argue that the use of the term community of practice as a proxy for all forms of situated knowing in the commercial environment is unhelpful, arguing that the social dynamics of craft and task based communities are significantly different from those found in the highly creativity communities that deploy ICT to facilitate distributed working and knowledge formation. From this critique, Amin and Roberts (ibid) identified four distinct types of communities of practice:

- Task/craft-based. The most classic example is given in Orr's (1996) study of Xerox technicians involved in replicating and refining a certain kind of craft-knowledge through shared practice. Within these communities, knowledge transfer is dependent to a large extent on co-location as much of the knowledge is tacit
- Professional. An example is given by Faulconbridge's (2007) study of collective learning in advertising and law reveals, professional associations can promote the dissemination of new knowledge.
- Epistemic/creative. Amin and Roberts describe this category as *"purposefully organised to unleash creative energy around specific exploratory projects and typically involving coalitions of scientists, product developers, academics, visual and performing artists, advertisers, software developers, consultants, media professionals, or designers"*.
- Virtual. Members use ICT to facilitate the exchange of knowledge

The extent to which Amin & Roberts' (ibid) identification of *virtual* as a separate category from the other three is questionable as the increasing prevalence of virtual working means that those communities of practice within the other categories are also operating virtually, especially in the case of the second and third categories, as Amin and Roberts (ibid) acknowledge.

Significantly, Amin and Roberts also challenge the view that effective social dynamics and interaction in all forms of Communities of practice require co-location and strong social ties and posit that weaker ties are more beneficial. These theoretical assumptions have profound implications regarding the extent to which spatially distributed actors can develop the necessary depth of relationship and the common sense of place, purpose and identity that underpin effective communities of practice. The purpose of my study is to examine these apparent contradictions in the extant literature and to deepen understanding of the opportunities and limitations, in respect of learning and knowledge creation that arise when members are spatially and temporally distributed and as a result are likely to have weaker social ties.

Summary of communities of practice

The concept of a community of practice has been the subject of a great deal of academic research, and evolved from the seminal work by Lave and Wenger (1991) on situated learning as a social locus for learning in practice, (Brown and Duguid 1991; Lave & Wenger, 1991; Wenger, 1998). These studies show how communities of practice form when people coalesce to *“participate in an activity system (practice) about which participants share understanding concerning what they are doing and what that means in their lives and for the community”* (Lave & Wenger, 1991; Wenger, 1998). A community of practice is a group of *“people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis”* (Wenger et al., 2002, p. 4). Two central inter-linked ideas underpin the concept of a community of practice- situated learning and the importance of specific practices as a bridge between work, learning and innovation (Lave and Wenger 1991, Brown and Duguid 1991). Both these concepts emphasise that learning and knowledge are co-constructed by participants within a specific context and social environment. Practitioners thus form epistemic networks within which specific practices, values and norms are inseparable from the knowledge that is being created. In other words, demonstrating some of the key characteristics of community. Wenger (1998) describes how communities of practice are formed as ties emerge from joint practice. Sharing a practice creates ties that in turn lead to strengthening of the community in which the practice is situated.

This leads, as Amit has argued compellingly, to the justification for the use for the word community by Lave and Wenger as follows:

“The emotive impact of community, the capacity of empathy and affinity, arise not just out of an imagined community, but in the dynamic interaction between that concept and the actual and limited social relations and practices through which it is realized. People care because they associate the idea of community with people they know, with whom they have shared experiences, activities, places and/or histories. In turn, they use these interpersonal relations to interpret their relationship to more extended social categories” (Amit 2002: 18)

2.3.2 Social Ties

The previous section highlighted how different forms of communities of practice emerge as co-location becomes less prevalent with the associated effect on the importance of strong social ties. This section will examine how theories associated with social ties impact on the community of practice concept with particular emphasis on how social ties effect knowledge creation. The relevance of this stream of literature to this thesis is due to the importance of social relations in explaining both individual action and collective outcomes and how virtual working influences the importance and relevance of strong social ties.

In using the word *community* Lave and Wenger have placed a particular interpretation on the word, which, as Willmott (1989) argues, is associated with the notion of attachment. Willmott (ibid) posits that it is quite possible for people who may not share a space or a way of working to be attached in some other respects – for example family and friends. In this regard, Anthony P. Cohen (1982; 1985) argues that communities are best approached as ‘communities of meaning’. In other words, “community” plays a crucial symbolic role in generating people’s sense of belonging’ (Crow and Allan 1994: 6). The true meaning of community, Cohen argues, lies in its members’ perception of the strength of its culture - what Putnam (2000) calls ‘social capital’. Cohen explains that *“People construct community symbolically, making it a resource and repository of meaning, and a referent of their identity”* (Cohen 1985: 118).

Various scholars have defined the term Social capital as follows:

Bourdieu: *'Social capital is the 'the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance and recognition' (Bourdieu 1983: 249).*

Coleman: *'Social capital is defined by its function. It is not a single entity, but a variety of different entities, having two characteristics in common: they all consist of some aspect of a social structure, and they facilitate certain actions of individuals who are within the structure' (Coleman 1994: 302).*

Putnam: *'Whereas physical capital refers to physical objects and human capital refers to the properties of individuals, social capital refers to connections among individuals – social networks and the norms of reciprocity and trustworthiness that arise from them. In that sense social capital is closely related to what some have called "civic virtue." The difference is that "social capital" calls attention to the fact that civic virtue is most powerful when embedded in a sense network of reciprocal social relations. A society of many virtuous but isolated individuals is not necessarily rich in social capital' (Putnam 2000: 19).*

Communities build up social capital through the norms and habits that are shared by the members of the community. One way of assessing the quality of life within a community is to consider the extent to which people share a common understanding of how to behave towards each other and towards others who are not members. Cohen and Prusak (2001: 6) looked at the notion of social capital in firms and organisations and concluded that the benefits that flow from social capital within organisations include better knowledge sharing and less hoarding as a result of higher levels of trust. This field of research has been the subject of a wide range of studies (e.g. Allen, 1977; Burt, 1992; Hansen, 1999; Alguezaui and Filieri, 2010. Strong ties means relationships are more intense and with a greater degree of cohesiveness within the community. Burt (1992) refers to these dense networks as 'closure' and argues that trust is enhanced as a consequence as members have invested in the strength of the relationships upon which their social capital is based. This also allows the community to address more complex problems because they have developed a set of common cognitive routines.

On the other hand, the degree of closeness can also mean a high degree of homogeneity in terms of the knowledge that is held within the community and therefore much of the knowledge generated may be redundant. Weak ties may be more likely to bring new knowledge with less danger of redundancy. In this respect weaker ties can be beneficial as the flow of information from those with whom the tie is weaker can be greater. This is because weak ties create bridges between members of the network, which provide a person with more paths to information (Granovetter, 1973; 1983). Granovetter's (1973; 1983) theory of the strength of weak ties argues that weak ties are especially useful for learning because they facilitate access socially distant pockets of information which can stimulate the process of generating knowledge (Brass, 1995; Perry-Smith & Shalley, 2003). An example of this is found in Perry-Smith's study (2006), which identified a positive link between the number of weak ties in scientists' networks and the scientists' capacity to create knowledge.

Burt (1992) argues that there are holes between dense clusters and that these represent an opportunity for individual actors to play the role of broker in facilitating the flow of less redundant knowledge between communities of people with strong social ties. This implies that there are distinct advantages when people are free from the constraints of a tight knit group. However, weak ties mean that relationships are more ephemeral and shallow, thus making it harder for trust to develop. Moreover, a higher degree of heterogeneity means it may be more difficult to integrate knowledge and less able to solve complex problems. This is especially challenging when the degree of diversity in the community means that the perspectives and approaches of the various actors are fundamentally different which then requires '*substantial integrative work on the part of the individual*,' (Baer, 2010). This raises the question of whether the extent to which a community is diverse can be both an asset and liability based on the nature of that diversity and the types of knowledge that needs to be shared.

Summary of Social Ties

The general line of research examined in this section ties has focused on the presence of social ties between actors and the pattern of linkages between them in terms of the strength and density of those social ties. There are apparent contradictions in the literature. Firstly, extant studies have highlighted the value of both strong ties and their associated benefits of deeper relationships and greater community cohesiveness, whilst other studies have pointed to the benefit of weak ties which allow people from the edge or beyond the boundary of one's immediate circle to fill gaps in one's knowledge. The nature of the community itself may also be significant in terms of the question of the importance of social ties. As Amin & Roberts (2008) claim, task-based communities may well have stronger ties because much of their work requires co-location and this leads to deeper relationships and shared values. Professional communities and epistemic communities, on the other hand, have an identity and reputation based on joint membership of institutions and therefore personal relationships are less critical. Also, they are more likely to work virtually without the need for strong ties.

This study will address this apparent ambiguity by examining the concept of social ties through the lens of virtual working, which is defined, and the use of ICT to mediate interaction and which means that communities are geographically distributed.

The following chapter examines the relevant literature on virtual working and virtual communities and provides a definition and of virtual working as well as presenting the characteristics of virtual communities of practice.

Chapter 3 - Virtual working

3.1 Introduction

This chapter reviews the relevant literature on virtual working and provides a definition and of virtual working of the term as well as presenting key characteristics of virtual communities of practice.

3.2 Definition

Typically, the term virtual working is applied to situations in which people use ICT to mediate their interactions (Dubé et al. 2006). Moreover, much of the literature has focused on the notion that communities are either completely co-located or completely virtual with no face-to-face elements in their ways of working. However, as well as dependence on ICT, there are other significant factors that determine the degree of virtuality in the way a community operates. These are described below.

3.3 Characteristics

The study by Gibson and Gibbs (2006) identified four characteristics associated with the term 'virtuality'. These are dependence on ICT, distributed location, fluid structure and national diversity. Each of these factors has nuances that will cause differential effects and while dependence on ICT is often synonymous with distributed geographical locations, it may not always be the case that the community is geographically dispersed as some members could be in the same building but on different floors. Similarly, communities could include members who are from multiple countries or from only one or two and this will have a differential effect on knowledge creation and sharing. The same applies to the amount of stability in the structure of the community as some have a higher degree of longevity in membership while others are subject to frequent changes.

These elements are summarised in the table 3.4 below.

Table 3.4: Elements of virtuality and characteristics of vCOPs. Developed by author based on CoP literature.

Element	Characteristics
Dependence on Technology	Face to screen v face to face
Dispersion	Geographical and Temporal distribution
Diversity	Nationalities, cultures and languages
Nature of Membership	Fluid, dynamic and unstable - no history and no future

3.3.1 Dependence on technology

The term 'virtual working' is often defined quite differently across the literature and in many studies the notion remains rather vague, (Reimer & Vehring, 2012). For the purposes of this study the term virtual communities of practice refers to those communities of practice where their members use information communications technology (ICT) as their primary mode of interaction, (Dubé et al. 2006). Some scholars have argued that actors prefer to give feedback face to face and so transfer of learning can be slower where dependence on technology is high, (DeSanctis and Monge, 2002).

Moreover, the fact that communities of practice depend on ICT to mediate their social interactions brings with it associated elements that are also significant as they determine the degree of virtuality in the way a community operates, (Gibson and Gibbs, 2006).

3.3.2 Dispersion

Virtual communities only have to cope with geographical distance, which often brings associated time differences. Improvisation is a key factor in knowledge generation, (Brown and Eisenhardt, 1995) and is likely to be limited when geographical dispersion is high. This could lead to misunderstandings due to lack of awareness of local context and failure to spot tacit knowledge elements (Carson et al, 2003).

Reliance on ICT may reduce opportunity for interpreting subtle nuances associated with non-verbal cues, especially when giving and receiving feedback, (Kirkman, et al, 2006).

3.3.3 Diversity

Culture and language differences and could result in diminished opportunities for informal collaboration and knowledge sharing as the ability to construct shared dialogues, identities, stories and jargons that underpin new practices is impacted when the community operates in the virtual space. Different national cultures lead to different ways of thinking feeling and behaving, (Earley and Gibson, 2002) which could inhibit the development of common ways of working which are necessary for the development of Practice in which members of the CoP are mutually engaged, (Wenger, 1998). Conflict resolution could also be problematic as national identity can lead to different worldviews and associated misunderstandings and stereotyping and the inability to reach consensus (Adler, 1997).

3.3.4 Nature of membership

Virtual working often means that work can be temporary in nature – project teams are a good example – with limited opportunity for actors to form a deep and lasting relationship. Working across geographical space also makes it more problematic to manage community knowledge well (Majchrzak et al., 2000). Also, strength of social ties is a factor (Granovetter, 1973, 83) as new members will have weaker ties and complex or risky knowledge sharing may be inhibited as a result (Perry Smith and Shalley, 2003). As a result organisations need to ensure that knowledge can be effectively transferred from individual members to the team and to the organisation for future reference (Griffith et al., 2003). Some have argued that fluid membership in virtual teams frequently means that they fail to manage knowledge well (Caldwell and Koch, 2000; Malhotra et al., 2001). This has been explained by the difficulty of developing inter-personal trust at a distance (Handy, 1995; Cramton, 2001); trust being a critical component of productive working relationships and effective knowledge.

Geographical distance, time, culture & possibly language differences could affect the issues of safety and trust which are critical for developing a learning environment (Grisham, Bergeron, & Brink, 1999; Palloff & Pratt, 1999).

Moreover, these elements of virtuality could also challenge to the spirit of togetherness which is vital for the establishment of a community ethos, (Wenger, et al 2005).

3.3.5 Spectrum of virtuality

Therefore, in summary, when a community of practice is reliant on ICT to communicate it follows that distributed location will be present and therefore, it is possible that national differences, cultural differences, language differences, time differences and fluidity of structure will also be prevalent. This introduces the notion of hybridity as the elements of virtuality vary from group to group. The term hybridity has been used by Chamakiotis, et al (2015), building on work done by Panteli, (2004), to describe the impact of virtual working on the issue of work life balance as the boundaries between work and non-work become ever blurred. The term can also be applied in the context of this thesis. Communities of practice can be considered to be on a spectrum of virtuality, varying between high and lower degrees of co-location and geographical distribution depending on their circumstances. Some communities of practice can be entirely co-located and others entirely virtual whilst others can transition from one end of the continuum to the other – hence hybrid. Therefore, an appreciation of how the different elements of virtuality influence knowledge creation is critical to furthering our understanding of the implications of virtual working for communities of practice. As Gibson and Gibbs, (2006) argue, *“Whilst each of the elements of virtuality contribute to the virtual working, they are likely to have unique effects and should be considered independently.”*

3.4 Virtuality and social dynamics

Whilst there are some studies that have addressed the topic of virtual working, the research has remained limited. In the initial wave of the development of digital technology the emphasis was on making the codification, storage and retrieval of knowledge more efficient, (Accenture, 2014) with largest number of studies focused on open source communities, (West & Lakhani, 2008). More recent studies have examined the developments in digital technology that have facilitated the greater collaboration and social interactions that are now increasingly characterised by the use of e-mail, VOIP, videoconferencing and social media.

The notion of how social dynamics are impacted by virtuality is examined by a number of scholars. These include studies on the concept of electronic networks of practice undertaken by Wasko, M. M., & Faraj, S. (2005) on the extent to which social capital plays a part in knowledge sharing in electronic networks of practice, and Agterberg, M., Van Den Hooff, B., Huysman, M., & Soekijad, M. (2010) on how organisational learning can be encouraged through the application of the electronic networks of practice.

Further studies on the effect of virtual working on social dynamics include:

- Factors that inhibit or encourage participation in virtual communities of practice, were identified by Ardichvili, et al, (2003)
- The importance of distance as an element of human interaction is the subject of the study by Olson & Olson, (2000)
- Social capital in virtual communities was examined by Daniel, et al, (2003)
- Panteli, et al, (2008) conducted research into trust in virtual teams
- The extent to which creativity is influenced as a result of virtual working, was studied by Panteli, Chamakiotis, et al, (2013)

These studies have shown that virtual working does not necessarily preclude all face-to-face interaction, however geographical and temporal dispersion, pressures of busy schedules and the financial and environmental impact of travel are all contributing to making virtual working more prevalent. As a result, the rapid development of digital technologies has facilitated the widespread search for greater flexibility to incorporate more diverse groups of people in knowledge creation. Associated with this is the prevalence of remote working, which is inhibiting regular engagement in co-located communities of practice and contributing to the formation of virtual communities of practice as a result, (Murillo 2006). This means that knowledge is being increasingly developed within groups of people who interact in a virtual and distributed way. This highlights important issues regarding the nature of practice when it is disassociated from geographical space and face-to-face contact. The issue of the extent to which the sharing of knowledge is inhibited by the concept of tacitness (Polanyi, 1966) is an important factor to examine in this context.

Moreover, as Carlile (2002), identifies knowledge is localised, focused and developed around particular issues in day-to-day work, therefore the implications of this when knowledge needs to be transferred across geographical, time, language and cultural boundaries is a significant aspect which this thesis will examine. This point is particularly relevant in communities of practice with a high degree of language and cultural diversity. As Williams, (2011) highlights, *“knowledge transfer involves transmission of knowledge from sender to recipient, as well as its integration and application by the recipient”*.

The extant literature demonstrates that digital technology allows people within distributed communities to build and maintain relationships in the same network. However, the consequence of the use of technology seems to be that people can now have access to far wider networks of people than is available for co-located groups. The studies by numerous writers, (e.g. Memmi, 2006; Kimble and Hildreth, 2005; Murillo 2006; Dubé et al. 2006; Correia et. al. 2009) show how virtual communities can consist of many more people than co-located communities and relations between members tend to be casual and informal. The study undertaken by Marabelli, Rajola, Frigerio and Newell (2013), shows how group membership in virtual communities can be goal-oriented, project based, temporary, with a group structure that evolves rapidly. Their research highlights how virtual working can facilitate the informal interaction between people to generate new knowledge. In many cases members are geographically separate, may never get to know each other and yet share common or similar work, (Kimble and Hildreth, 2005). Kimble and Hildreth (ibid) have identified a number of factors that can facilitate or inhibit participation and knowledge sharing within virtual communities working in the knowledge economy. They argue that knowledge should not be regarded as explicit on the one hand or tacit on the other, but rather as a ‘duality’. They take the view that all knowledge has both hard and soft elements that lend themselves to be captured and stored electronically in varying degrees. The most common forms of hard or explicit knowledge are manuals, documents, procedures and processes – including ‘how to’ videos. Whereas, tacit or soft knowledge is more associated with people and their relationships and is socially constructed. They go on to state that, whilst all knowledge has both hard and soft aspects, the availability of softer forms of knowledge depends crucially on the degree of participation and this is the key issue that virtual communities need to address.

Working across geographical space also makes it more problematic to manage team knowledge well (Majchrzak et al., 2000). This is because the ability to construct shared dialogues, identities, stories and jargons that underpin new practices which is a key element of knowledge generation, (Lave and Wenger 1991), is impacted when the community operates in the virtual space with social interaction mediated through technology, (Amin and Roberts 2008). In summary, working in a remote, distributed manner means that the opportunities for informal collaboration and knowledge sharing may be diminished or perhaps even lost as virtual communities not only have to cope with geographical distance, but also time, culture and possibly language differences.

Knowledge workers are often conflicted by the dilemma of whether to hoard or share their knowledge, (Kelley and Thibaut 1978) and this is made more acute when the community or team is virtual and remote working applies (Majchrzak et al., 2000). The question many face is: should I share my knowledge and run the risk of making myself vulnerable by giving away my source of power and influence? Or do I share my knowledge, wisdom and expertise for the benefit of the community? The way in which individuals deal with this dilemma is largely a matter of perception. Do they believe and trust that the consequences of knowledge sharing will be positive or negative? This perception can be affected by the question of reward, which can fall into the two categories of intrinsic and extrinsic. Intrinsic rewards associated with a sense of satisfaction derived from contributing to the success of the community and fulfilling one's obligations to ensure reciprocity are a very powerful motivator of knowledge sharing behaviour, (Krogh and Grand 2002). Of course, the fear of being seen as not reciprocating and being considered guilty of 'free riding' can be just as powerful a driver to knowledge sharing behaviour in virtual communities. Financial incentives such as an appropriate level of both salary and bonuses can also play an important part (Hall and Graham 2004).

Panteli (2005) argues that a focus on establishing clear goals is key to the cohesiveness of the team and helps to build trust between members. Further studies have shown how virtual communities of practice can perform a central role in promoting collaboration between members who are dispersed in both time and space. In many cases the communities consist of distributed members of one organisation, although there is an increasing tendency for the community to become a vast virtual platform, where partners,

customers, suppliers and the organisation could meet and learn, (Dubé et al. 2006). Bates (2014) has argued that digital technology has contributed to a working environment that is more volatile, complex, uncertain and ambiguous than before and in this work context communities of practice can be very effective in creating and sharing knowledge. These communities are characterised by infrequent interactions, temporary membership, large numbers of people, and little identification with the group as a whole. (Memmi, 2006). Furthermore, they tend to identify with an idea or goal, rather than relate to group of people in a physical location.

Despite the increasing number of studies into virtual communities there has been relatively little research into how these new wave developments in technology impact on learning and knowledge sharing as a function of social relationships. This raises the issue of whether this type of social interaction when it is mediated through technology is capable of providing a sufficient platform to facilitate the development of Wenger's (1998) three key components of a community of practice:

- Mutual engagement through which, by participation members establish norms and collaborate with each other through the building of relationships
- Joint enterprise which enables them to create a common understanding of what binds them together
- Shared repertoire of communal resources which can include documents and other, possibly symbolic artifacts

This study will examine the extent to which social relationships, the socialisation of new members through the process of legitimate peripheral participation, the notion of practice and the concept of community are influenced by the different elements of virtuality. These aspects have not been examined in the literature.

Summary

The balance of the arguments in the literature on virtual communities of practice emphasises that virtual working is contributing to the formation of flatter, more flexible, temporary groups within and beyond the boundaries of organisations and allowing people to coalesce around common aims and shared goals with associated benefits in the creation

of knowledge. This raises some profound questions regarding the notion of *community* and how it should be defined in the context of virtual working. Firstly, does virtual working enable individuals to interact and create knowledge with less emphasis on strong ties, prescribed relationships and the associated degree of hierarchy embedded in the notion of community? Secondly, does virtual working mean that the sharing of common goals has primacy over social relationships in respect of learning and knowledge sharing? This thesis will examine whether virtual working contributes to knowledge creation by facilitating the development communities where connections are based on shared goals rather than on the strength of interpersonal relationships.

Whilst there is a rich vein of literature on Communities of practice (e.g. Lave & Wenger, 1991, Brown & Duguid, 1991, etc.) and on the concept of social ties and the effects upon social capital accumulation and knowledge creation (e.g. Burt, 1992; Granovetter, 1973; Coleman, 1990; Baer, 2010), there is a limited number of studies in the area of virtual working and social dynamics.

Although the insights obtained from previous work are invaluable there are some apparent ambiguities. Some of the studies argue that knowledge creation is dependent on social relationships for which strong ties are a necessary requirement. At the same time other studies argue that with the increasing pace of globalisation distant relationships and infrequent contact through virtual technology is enabling new knowledge to be generated through weak ties that enable non-redundant ties to be leveraged and a wider number of people to be reached. This raises significant implications for how knowledge creation takes place in virtual communities.

Some of the key issues identified include the point that trust affects knowledge sharing. (Jonsson and Kalling, 2007) and when social ties are weak trust may be impacted. The same is true for a strong sense of identity, which can inhibit collaboration with those of a different grouping, (Massingham, 2010). This can also lead to potential conflicts between perceived difference of interests and difference in national identities, culture and language (Wijk et al., 2008). In some cultures, community of practice members place a high priority on preserving social harmony. This means that senior people are rarely challenged for clarification of a message for fear of causing the senior to lose face, (Mead, 2005).

This can result in problems in terms of trust, openness and relationships within the Community. It can also mean that other members can be operating under a complete misapprehension of the extent to which his/her communication is understood and being acted upon. Furthermore, knowledge transferred cannot be assumed to have the same meaning for both the person expressing and receiving it and this can cause problems if it is not clear what knowledge is being transferred, (Carilile, 2002).

Moreover, knowledge is particular to a community because it emerges through ***situated activity***. Such situated work practice leads to the development of local understandings when the community is distributed through geography and time. This can also lead to strong subcultural understandings of their work and different domains of knowledge with diverse ways of learning. The consequence may be that language and cultural differences mean members will have difficulty in adapting to the distributed community's subjective viewpoint and learning to speak its '*language*'.

The literature review highlighted how, despite the fact that there are many studies that examine how a community-based approach contributes to learning, there is a lack of literature that specifically uses the lens of virtual working to examine the changing nature of social relationships on knowledge creation and knowledge sharing within communities of practice. This research thesis seeks to address this gap. The aim the study is to analyse the influence of virtual working on social relationships within and between organisation-based communities of practice and the implications for the theory of situated learning.

A synthesis of the key points that have emerged in the literature review indicates that the initial studies undertaken by Lave and Wenger (1991) and others referred to above, argue that knowledge creation and knowledge sharing in communities of practice requires co-location when the nature of the community of practice is associated with crafts and skills and a high degree of tacit knowledge. This is accompanied by a need for strong social ties and a size of group that is capable of generating cohesiveness and closeness with frequent interactions characterised by long standing relationship, shared values and sense of identity. Further studies on the rise of virtual communities referred to above argue that the importance of strong social ties becomes more questionable as the need for proximity diminishes and the nature of the community becomes more geographically distributed.

These scholars posit that this is associated with an increase in the size and scale of the group and the diversity of the members in terms of their skill sets, the heterogeneity of their knowledge, their language, shared values and culture all of which are more prevalent when members of the community of practice use ICT to mediate their interactions.

This thesis will unpack the communities of practice concept and analyse the implications of virtual working on:

1. The conduciveness of the overall environment for learning and knowledge creation
2. Importance of the strength of social ties in communities of practice and for the development of practice and the notion of community
3. The process of legitimate peripheral participation

The following chapter will explain and justify the research design, the choice of case study and the selection of cases, the operationalisation of theoretical concepts and the proposed means of data gathering and data analysis.

Chapter 4: Research Approach, Design and Methodology

4.1 Introduction

Chapters two and three provided a review of the body of literature in the following three interrelated streams:

- Communities of practice are key to the development and sharing of knowledge, (Lave and Wenger, 1991; Brown and Duguid, 1991; Wenger, 1998; Gherardi, Nicolini and Odela 1998; Amin & Roberts, 2008).
- Strong social ties and strength of social relationships are important foundations for learning in communities of practice, (Granovetter, 1973; 1983; Allen, 1977; Burt, 1992; Hansen, 1999; Alguezaui and Filieri, 2010).
- Virtual working creates challenges for the functioning of Communities of practice and may be contributing to a change in the way learning takes place in communities of practice (Caldwell and Koch, 2000; Majchrzak et al., 2000; Malhotra et al., 2001; Kimble and Hildreth, 2004; Amin & Roberts, 2008).

The literature review highlighted how, despite the fact that there are many studies that examine how a community-based approach contributes to learning, there is a lack of literature that specifically uses the lens of virtual working to examine the changing nature of social relationships on knowledge creation and knowledge sharing within communities of practice. This research thesis seeks to address this gap. The aim the study is to analyse the influence of virtual working on social relationships within and between organisation-based communities of practice and the implications for the theory of situated learning.

This chapter will explain and justify the research design, the choice of case study and the selection of cases, the operationalisation of theoretical concepts and the proposed means of data gathering and data analysis as well as presenting the theoretical framework that will guide the analysis and the propositions that arise which will be addressed by this study.

The chapter will outline the research questions that flow from the literature review and an explanation of the relationship between the primary questions and the sub-questions.

This will be followed by an explanation of the research approach and the research design, which will be set out as a 'road map' in figure 4.3.1 and by an explanation of the steps in the research design.

The chapter will then clarify the possible outcomes of the effect of virtual working on the factors under study and will conclude with the rationale for the design and the selection of cases, and the means of data gathering and data analysis.

4.2 Research questions

The primary research questions will examine the effect of virtual working on the importance of social relationships and the sub questions, the implications of this on the three fundamental features of a community of practice – *legitimate peripheral participation, practice and community*.

To ensure clarity, I reiterate the research questions below:

Primary question

RQ1. What are the implications of Virtual Working for the existence of a learning environment conducive to knowledge creation in communities of practice?

RQ2. What are the implications of Virtual Working for the importance of strong social relationships with regard to learning and knowledge creation in communities of practice?

Sub Questions

How does the importance of the strength of social relationships influence:

- *Legitimate peripheral participation*
- *The development of practice*
- *The sense of community*

The questions will be addressed through the following research approach and research design.

4.3 Research Approach and Research Design

4.3.1 Research Approach

The thesis deploys a qualitative research strategy which is the most appropriate as the aim of the research is to understand the phenomena being studied from the perspective of the participants, (Myers, 2000, p1). Furthermore, the approach has been an inductive one as the study *“involves the search for a pattern from observation and the development of explanations for those patterns”*, (Bernard, H.R. 2011).

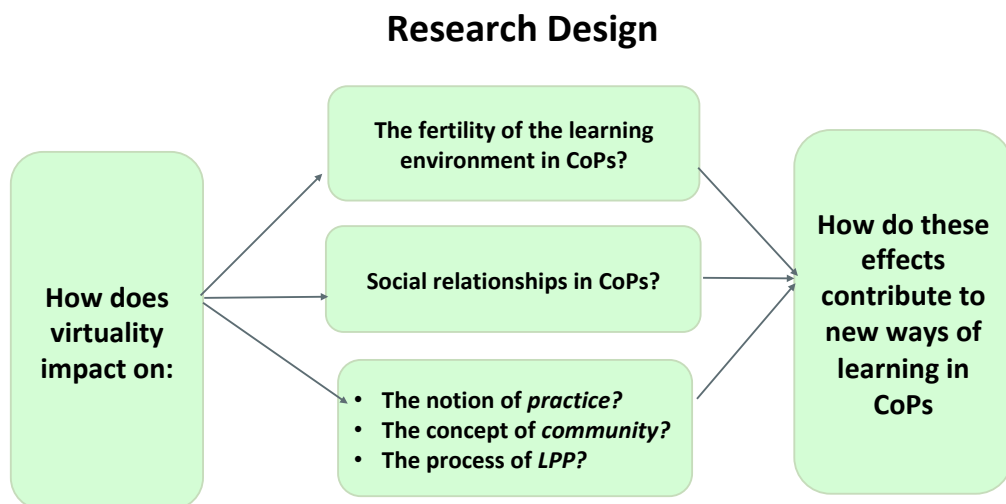
4.3.2 Research Design

The design is explanatory in nature and seeks to bring more clarity to the issues being studied, particularly as these have not been fully researched hitherto. A fuller rationale for the choice of research design is provided below.

4.3.2.1 Road map

Figure 4.3.1 below presents a more detailed ‘road map’ of the research design and illustrates how the study will examine how the elements of virtual working influence the fertility of the environment for knowledge creation within the community of practice.

Figure 4.3.1: Thesis research design. Developed by author based on communities of practice literature.



As Figure 4.3.1 makes clear, the research is designed to focus on how virtual working impacts on the social relationships, which the theory of situation learning considers a fundamental element of the Community of Practice concept. Since the *knowledge* and *knowing* generated in a Community of Practice is considered to be embedded in a specific situational context (Lave and Wenger, 1991), the generation and sharing of this knowledge in the context of geographical distribution raises questions for the way in which the process and nature of learning and knowledge creation can be understood. The study will examine the effect on social relationships when communities of practice are distributed across space and are not co-located, as is increasingly the case in today's workplace. The research design will facilitate an examination of whether strong social dynamics always require the strong social relationships needed by the communities studied by Lave & Wenger, (1991). Moreover, the research will also allow for an examination of whether virtual working can contribute to generating the degree of cohesiveness necessary for dealing with more intricate issues in the way that physical proximity and co-location is alleged to do. The implications of virtual working for the importance of social relationships in communities of practice will then be considered in relation to the associated elements of legitimate peripheral participation, the notion of practice and the notion of community.

4.5 Steps in Research Design

The research design is based on a series of steps as described in the table below. The table also indicates the chapters in the thesis where the findings that flow from each of the steps are discussed. The data gathering and data analysis methods deployed in the study are described below in more detail. The relationships between each of the steps is important as the data gathered from each will inform the discussions which will flow from the semi-structured interviews and will provide deeper insights and explanations into the phenomena being examined. The collection and analysis of data in this step-by-step method was influenced by the need to enable one data source to be triangulated by other sources through comparing responses of people with different points of view and this enabled the capture of different perceptions from a variety of perspectives of the same phenomenon.

The first step is to gather information from the participants on how the fertility of the environment and its conduciveness to knowledge creation is affected by each of the elements of virtuality. This stage in the design will enable the research to examine the challenges associated with working IT dependency, geographical dispersion, unstable membership, working around time differences and national, cultural and language diversity. The methodology for gathering and analysing data in this chapter is set out in table 4.5 below.

The next step is to examine how the elements of virtual working influence the importance of strong social relationships. This approach will consider whether virtual working, whilst enabling access to the most advanced technology, also aids or hinders the ability to construct strong social relationships characterised by shared dialogues, identities, stories and jargons that underpin new practices. The next step is to examine how social relationships in virtual communities influence the fundamental ideas that underpin the concept of a community of practice namely, legitimate peripheral participation, the notion of practice and the notion of community. The findings are presented in chapters six and seven of the thesis.

Table 4.5 below summarises this process.

Table 4.5 Steps in the research design. Developed by the author.	
Steps	Elements
	A study of the perceptions of Community of Practice members based on semi-structured interviews.
Step 1	How members feel about how the fertility of the environment and its conduciveness to knowledge creation is influenced by the elements of virtual working
Step 2	How the elements of virtual working influence the importance of strong social relationships
Step 3 a)	How the strength of social relationships effect the notion of <i>'practice'</i>
Step 3b)	How the strength of social relationships effect the notion of <i>'community'</i>
Step 3c)	How the strength of social relationships effect Legitimate Peripheral Participation

4.5.1 Summary

This section has presented a road map of the research design and has explained how the research will examine the implications of virtual working for the importance of the strengths of social relationships, the notion of 'practice' and the notion of 'community' and the process of legitimate peripheral participation. The next section will present the rationale for the research strategy.

4.6 Rationale for Research Strategy

The research is designed as a study of the perceptions of community of practice members based on semi-structured interviews with the aim of unpacking the extent to which virtual working influences the fertility of the learning environment, the importance of strong social relationships, legitimate peripheral participation, the notion of practice and the notion of community.

The design's purpose is to seek a better understanding of not just the challenges of virtual working for communities of practice but also how and why they emerge and how they can be addressed.

The research approach has enabled the researcher to use observations gained through interviews as a means of socially constructing insights into the phenomenon under examination. A qualitative case study design is deployed, with main units of analysis being three communities of practice and the use of the purposive sampling approach. This approach was adopted because it allowed the research to explore topics in depth and detail and enabled greater degree of flexibility in the data collection process.

The qualitative research strategy means that no numeric data or quantitative data was gathered or produced (Bell, 2005; Sarantakos, 2013; Silverman, 2004). This choice of design is particularly applicable for the purposes of this type of research, where the connection between several different factors had to be established through interpretation. Moreover, the research makes use of triangulation, which enabled the research objectives to be examined from different perspectives (Cohen and Manion, 2002; Altrichter et. al, 2008), thus enabling a more nuanced view of the connections between the different elements to be arrived at. This will be achieved by comparing responses from different participants each with different levels of responsibility and seniority. The nature of this study requires a detailed, in depth approach that sheds light on complex social phenomena and explains how learning and knowledge creation is impacted in different contexts and for different actors. In practice this means using a limited number of carefully selected case studies.

4.7.1 Research Setting

There are three organisations in the study:

- Case A, a professional Institution and one of the fastest growing bodies of its type in the world. Headquartered in London, but with global operations the institution has over 110,000 members in more than 140 countries.
- Case B, a multi-national corporation in the telecommunication industry.
- Case C – an SME headquartered in Brighton, with global reach, specialising in digital transformation within which virtual and co-located communities of practice are prevalent.

4.7.2 Selection criteria for the three organisations

The nature of the issues raised in the research questions necessitates that the communities of practice in this study are based in organisations that operate with varying degrees of virtual working. The researcher has had a long career in management consultancy and has good relationships with these organisations each of which agreed to support the research.

- Case A was selected because it is an organisation within which professional virtual and co-located communities of practice are prevalent
- Case B was selected because it is in the vanguard of the advances in digital and IP networking technologies that have had a dramatic effect on the development of virtual working. This corporation is one within which epistemic, expert and creative, virtual and co-located communities of practice are prevalent
- Case C was selected because it is an SME with global reach, specialising in digital transformation within which virtual and co-located communities of practice are prevalent and as such represented a counter balance to the other two much larger organisations

Each of the three cases provided opportunities to reveal different aspects of the phenomena being examined within each of their separate environments.

4.7.3 Selection criteria for the research participants

The author has access to a rich network of contacts developed during a career in management consultancy and as a result has been able to rely on previous working contacts in these organisations. The senior managers in each organisation provided the potential candidates names and, random samples were drawn from each of the groups.

4.7.4 Data sources

The communities of practice in the study have varying degrees of virtuality and are tasked with developing and delivering learning and development programmes to key stakeholders within inter and intra-organisational settings. These have been identified by gathering empirical evidence through questions based on Wenger's (1998) key requirements of Mutual Engagement, Joint Enterprise and Shared Repertoire. Table 3.7 shows the operational definition of these terms used by Wenger (1998):

Table 4.7.1 Characteristics of communities of practice. Developed by the author.	
Term	Characteristics
Mutual Engagement of members (Wenger 1998)	People work together and reach consensus on what needs to be done. People know each other's competencies and can support and complement each other. People have interpersonal relationships.
Joint Enterprise (Wenger 1998)	People negotiate what is important and why.
Shared Repertoire (Wenger 1998)	This can be seen as the stock of skills or types of behaviour that people habitually use and include tangible objects such as tools and policies and intangible ones such as narratives, stories, gestures, words and symbols

Knowledge sharing and learning is defined as improvements that occur in the practice in which the community is engaged (Ingram and Baum, 2001). Each of the chosen organisations provides an environment within which epistemic, expert and creative virtual and co-located communities of practice are prevalent. The types of communities that will form the sample in each of the organisations in the research setting will be those that develop knowledge leading to competitive advantage and innovation related to their

operational area and in this respect are similar to the Xerox Engineers which formed the basis of the work done by Brown and Duguid, (1991). In their landmark study, Brown and Duguid identified how informal groups form spontaneously to address common problems. They demonstrated how these groups innovate in an improvised way to find solutions when the canonical accounts of their work are inadequate, as they often are. Similarly, with the communities in this study, the emphasis is on finding novel solutions to problems that occur in their day-to-day work rather than on the reproduction of existing knowledge.

4.7.5 Data gathering

Data has been collected through semi-structured interviews conducted with members of the communities of practice in the study. Interviews were conducted with a total of 30 members, including managers, of the three communities of practice. The procedure for selecting participants was that of purposive sampling. The selected people were contacted by email to solicit their participation in the study. Interviews with community managers and delegates were conducted by phone/Skype and face-to-face. Interviews lasted 45 minutes to and were tape-recorded and transcribed with the permission of the participants.

This approach was selected because interviews are an effective means of gathering a wide range of inputs. The interview questions were based on the literature review in chapters two and three and the theoretical framework and were initially piloted with 5 members of one of the communities of practice. The pilot was designed to provide valuable feedback which then enabled the fine-tuning of several interview questions, and the elimination of other questions that were thought to be redundant. During the data gathering process interviewees were encouraged to articulate their personal experiences of virtual working and their feelings about it. Meetings and interviews were arranged by using personal contacts and those of the research partners. In order to address the research questions interview questions were designed to guide the conversations with the respondents. The questions covered the interviewees' perception of:

- The degree of virtuality with which they work, based on use of technology and geographical distribution, temporal distribution, national, cultural and language diversity. These questions were a valuable way of gathering participants' feelings on the mediating effect of the elements of virtuality.

- The importance of the strength of social relationships based on Granovetter's (Granovetter, 1973) definitions of closeness, duration and frequency.
- The extent to which their practice and their sense of community and esprit de corps is influenced by their degree of virtuality.

A total of 30 people were interviewed consisting of members of the communities of practice in the study. The interviews were conducted either face to face or via VOIP using Skype, Face Time or WhatsApp voice call.

4.7.6 Overview of participants

The table below provides information on the participants without sacrificing confidentiality and anonymity.

Table 4.7.2 Title of Interviewees
Case Study A
Director of Consultancy
Principal Consultant
Principal Consultant
Director of Client Development
Senior Consultant
Consultant
Senior Consultant
Head of Operations
Consultant
Consultant
Consultant
Consultant
Case Study B
Senior Learning Consultant
Developer
Head of Leadership Development
Senior Learning Consultant
Senior Learning Consultant
Senior Learning Consultant
Senior manager
Senior manager
Senior Learning Consultant
Head of client services
Case Study C
Head of data
Head of client services
Head of Business Development
Head of Operations
Developer
Developer
Project manager
CEO

4.7.7 Data collected in each organisation

Each interviewee was initially asked some general questions with the aim of establishing rapport and gaining some background information about their role and responsibilities, the length and breadth of their experience in the role. Following these questions each participant was asked questions relating to the research design described above as follows and are summarised in table below.

Table 4.7.3 below summarises the nature of the data collected and provides examples of the questions used in the semi-structured interviews.

Table 4.7.3**Summary of
Nature of Data
Collected from
each Case.****Developed by the
author**

Theme	Operationalisation	Example questions
Virtual working	<p>Degree to which each of the following elements of virtuality feature in their community's ways of working.</p> <ol style="list-style-type: none"> 1. Dependence on ICT 2. Distributed location 3. Fluidity of Structure 4. National diversity <p>The greater the number of elements means a higher degree of virtuality.</p>	<p>How much of your working time is spent outside of a conventional office?</p> <p>To what extent do you rely on people you rarely meet because they are a different part of your place of work?</p> <p>To what extent do you rely on people who are in a different geographical location in your home country?</p> <p>To what extent do you interact with people on temporary projects and with whom you have no previous relationship?</p> <p>To what extent do you rely on people who are in a different time zone?</p> <p>To what extent do you rely on people in a foreign country whose mother tongue is different to yours?</p>
Strength of Social relationships	<p>Identify up to 5 contacts that provide new information or insights about work-related issues</p>	<p>Rate items of closeness, duration, and frequency (Granovetter, 1973):</p> <p>Closeness - "How close are you with each person?" (1 acquaintance, 2 distant colleague, 3 friendly colleague, 4 close colleague, 5 very close colleague)</p> <p>Duration - "How many years has each relationship been in existence?" (1 = less than one year, 2 = 1 to 3 years, 3 = 4 to 6 years, 4 = 7 to 9 years, 5 = 10 or more years)</p> <p>Frequency - "On average, how frequently do you communicate with each person?" (1 = once a year or less, 2 = several times a year, 3 = once a month, 4 = several times a month, 5 = several times a week, 6 = daily)</p>

<p>Impacts on Situated Learning Theory</p> <p>LPP</p>	<p>Explore how LPP, Practice and Community are impacted by virtual working</p>	<p>How are new members socialised into the community?</p> <p>How do they gain the knowledge they need in an environment with less social interaction than in a co-located community and where new members have a reduced opportunity to observe others in situ in a common context?</p> <p>What are the chances of a greater degree of misunderstandings occurring due to lack of awareness of local context and failure to spot tacit knowledge elements?</p> <p>How are the subtle nuances associated with non-verbal cues interpreted, especially when giving and receiving feedback?</p>
<p>Practice</p>		<p>As face-to-face feedback is inhibited by virtual working how is learning and the implementation of changes affected?</p> <p>How does virtual working impact on improvisation, which is recognised as a key factor in knowledge generation?</p> <p>How does virtual working effect members' ability to share tacit knowledge through social interaction with, and observation of, the practices of other members of the community?</p> <p>When members are spread across many locations and there are fewer opportunities for informal collaboration does knowledge sharing become more difficult?</p>

Community		<p>To what extent is the notion of community challenged by cross boundary collaboration and ad hoc groupings that emerge spontaneously as members discover common areas of interest with a far wider group?</p> <p>Do more fluid structures lead to uncertainty and if so how does this impact on perceptions of risk and lack of trust?</p> <p>Does virtual working limit observation of the way fellow members behave and if so how does this challenge the notion of community and sense of belonging and identity?</p> <p>How does geographical distance, time, culture & possibly language differences affect the issues of safety and trust in fellow community members which are critical for developing a learning environment?</p> <p>How is the spirit of togetherness, which is vital for the establishment of a community ethos, affected?</p>
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A full list of the quotations from the participants in each of the cases is provided in the appendix.

4.7.6 Data Analysis

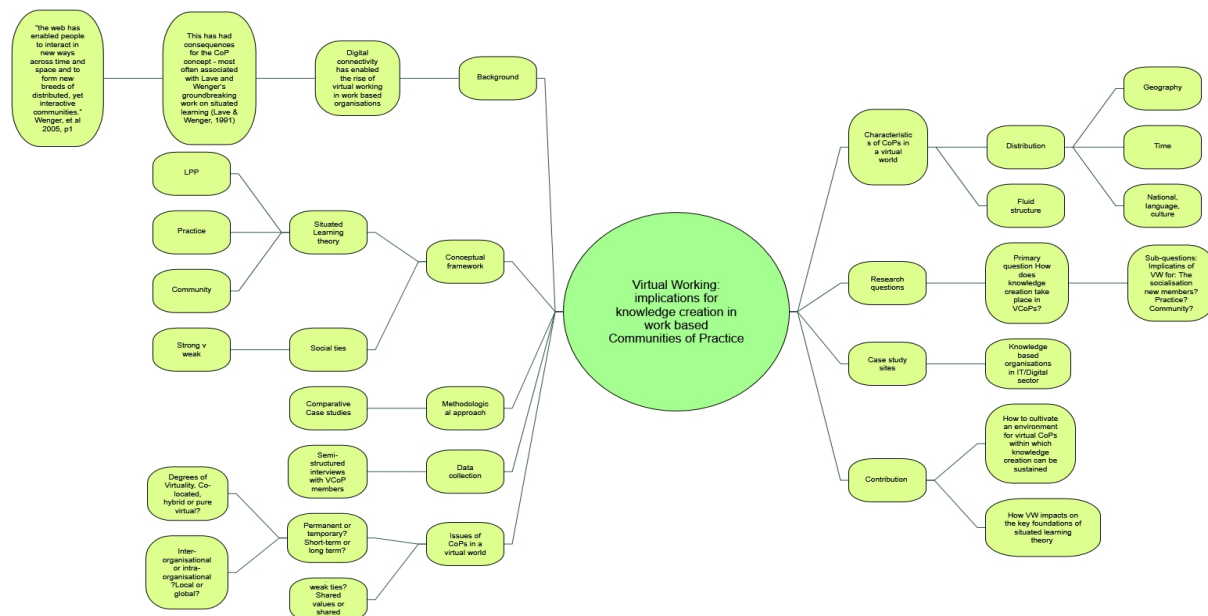
The data in this study was collected through the process of semi-structured interviews and participation of the interviewees was entirely voluntary. The logistics aspects for the interviews were mutually agreed between the researcher and participants and the interviews were audio recorded with the agreement of all the interviewees who were all informed about the use of the information and confidentiality. Each interview lasted 40-45 minutes. The interviews provided the qualitative data in relation to the main themes and the qualitative data analysis was conducted using Nvivo, which enables interview transcription and thematic coding.

Use of NVivo

The research examined how virtual working impacts on the social construction of knowledge embodied in the concept of a community of practice. Figure 4.6 below sets out how NVivo was used initially to code and categorise the data from two perspectives. Firstly, by using Gibson and Gibbs (2006) aspects of virtuality which characterise communities operating in a virtual world; dependence on technology to mediate interactions, geographical distribution, time differences, national, language and cultural diversity and fluid structure on the one hand and, secondly by using the foundational elements of a community of practice; the importance of social relationships, the notions of practice and community and the process of legitimate peripheral participation, on the other hand.

NVivo codes and themes

Figure 4.7.4 NVivo codes and themes



As the data analysis progressed these themes were refined in order to provide greater understanding of the phenomena under study. One of the ways this was accomplished was through identifying the number of occurrences of a theme. The process was iterative and the data was analysed in relation to the literature whilst taking care to not limit the possibility of findings that could contradict the extant literature.

This approach provided an effective means of examining whether and how effective key dimensions of a community and common social practice can be constructed when members are spatially distributed.

4.7.7 Cross-case comparison

As the study was conducted by examining three cases the above process was replicated on the data collected from each of the cases.

The themes were explored in each case by asking the participants the same questions as follows:

Fertility of the environment

Participants were asked to comment on how virtual working effects the fertility of the environment in respect of knowledge creation in their community.

Social relationships

- Participants were asked to comment on how virtual working impacts on the nature of social relationships in their community.

Degree of virtuality

Participants were asked to identify the degree to which each of the following elements of virtuality feature in their community's ways of working.

- Dependence on ICT
- Distributed location
- Fluidity of structure
- Cultural diversity
- National diversity

Legitimate Peripheral Participation

Participants were asked:

- How are new members socialised into the community?
- How do they gain the knowledge they need in an environment with less social interaction than in a co-located community and where new members have a reduced opportunity to observe others in situ in a common context?
- What are the chances of a greater degree of misunderstandings occurring due to lack of awareness of local context and failure to spot tacit knowledge elements? How are the subtle nuances associated with non-verbal cues interpreted, especially when giving and receiving feedback?

The effect on “practice”

Participants were asked:

- As people prefer to give feedback face to face is learning and the implementation of changes in practice slower as a result?
- How does virtual working impact on improvisation, which is recognised as a key factor in knowledge generation?
- How does virtual working effect members’ ability to share tacit knowledge through social interaction with, and observation of, the practices of other members of the community?
- When members are spread across many locations and there are less opportunities for informal collaboration does knowledge sharing become more difficult?

The effect on “community”

Participants were asked:

- To what extent is the notion of community challenged by cross boundary collaboration and ad hoc groupings that emerge spontaneously as members discover common areas of interest with a far wider group?
- Do more fluid structures lead to uncertainty and if so how does this impact on perceptions of risk and lack of trust?
- Does virtual working limit observation of the way fellow members behave and if so how does this challenge the notion of community and sense of belonging and identity?
- How does geographical distance, time, culture & possibly language differences affect the issues of safety and trust in fellow community members which are critical for developing a learning environment?
- How is the spirit of togetherness, which is vital for the establishment of a community ethos, affected?

As suggested by Yin (2009) the cases were each considered as separate and treated as such. This enabled the findings to be combined in order to examine the implications of virtual working for knowledge creation and sharing in work-based communities of practice. This approach facilitated the comparison on similarities and differences between the cases in relation to each of the themes.

As a means of validation following the interviews, five participants were randomly selected in order for them to review the preliminary findings. This approach also enabled possible rival explanations to emerge that served as a means of increasing the robustness of the analysis and providing a critical check and balance to increase the credibility of the research findings. The final results have been laid out in themes relating to each of the questions in the semi-structured interviews. The approach adopted the meaning and verbal transcription of interviews and as such allows for rephrasing and the focus on the sections of the interview that are most relevant to the research. The transcriptions have led to a number of quotations from the participants, which have been summarised in the appendix. A number of the more significant quotations have been presented in the empirical findings chapters as they “bring in the voice of the participants”(Creswell, 1998).

4.8 Summary

This chapter has explained that despite the fact that there are many studies, which examine how a community-based approach contributes to learning, there is a lack of literature that specifically uses the lens of virtual working to examine the interaction between social relationships and knowledge creation and knowledge sharing within communities of practice and the associated implications for legitimate peripheral participation and the notions of practice and community. The chapter has presented the research design and provided a detailed explanation of the implications of virtual working for the theoretical assumptions which underpin the practice based view of knowledge on which Lave and Wenger's (ibid) concept of a community of practice rest; namely, the importance of the strengths of social relationships and the consequential effects on legitimate peripheral participation – which is the socialisation of new members, and the notions of '*practice*', and of '*community*'.

The chapter has provided a '*road map*' which sets out how the design approach will firstly examine how the phenomenon of virtual working influences social relationships through the elements of virtuality which are dependence on ICT, distributed location, fluid structure and national diversity, (Gibson and Gibbs, 2006) and how each one of these factors has nuances that will cause differential effects. The chapter has explained how the research design allows for an explanation of how and why the elements of virtuality affect the degree of importance that social relationships represent to the process of knowledge creation and sharing. In addition the design also facilitates an examination of those implications in relation to the concepts of legitimate peripheral participation and the notions of '*practice*', and of '*community*'. Furthermore, the design provides scope to consider how new forms of learning are emerging, ones that do not rely on the conventional notions associated with the concept of communities of practice.

The chapter has provided an explanation of the case study methodology that will be applied to examine the how virtual working affects the relationship between social relationships and learning within communities of practice.

In addition, the chapter has explained the research design and the rationale for the choice of case study as the strategy, the selection of the cases, the data collection methods, operationalisation of the theoretical concepts, the data collection and analysis approaches and the method for comparing the findings from each of the cases.

Chapter five presents further information about each of the three cases that provided the setting for the research.

Chapter 5 - The case studies

5.1 Introduction

As explained in chapter four the nature of the research questions necessitates that the communities of practice in this study are based in organisations that operate with varying degrees of virtual working and, as a result of a long career in management consultancy, the researcher was able to identify suitable cases for the conduct of the study. There are three organisations in the study which has enabled the research to investigate the development of communities of practice across virtual spaces as they provide an ideal setting for examining whether and how effective key dimensions of a community and common social practice can be constructed when members are spatially distributed.

This chapter presents an overview of each of the three cases together with an explanation of the nature of the communities of practice and the type of technologies used together with examples of virtual working in which the members engaged. The communities examined within this study have different degrees of virtuality ranging from regular face-to-face meetings to a greater reliance on ICT. In all three cases the main purpose during their interactions is to find creative and innovative solutions to problems that occur in their day-to-day work.

- Case A was selected because it is an organisation within which professional virtual and co-located communities of practice are prevalent
- Case B was selected because it is in the vanguard of the advances in digital and IP networking technologies that have had a dramatic effect on the development of virtual working. This corporation is one within which epistemic, expert and creative, virtual and co-located communities of practice are prevalent
- Case C was selected because it is an SME with global reach and as such represented a counter balance to the other two much larger organisations

5.2.1 Case A

This organisation is one of the fastest growing professional engineering institutions. Headquartered in London, but with operations around the world, the Institution has over 110,000 members in more than 140 countries, working at the heart of the most important and dynamic industries. As such it represents a global organisation within which professional virtual and co-located communities of practice are prevalent. Within the institution there are communities of practice, which focus on key themes associated with the nature of the work of the institution. These communities of practice promote the need to share knowledge, change behaviour and drive advances in technology to reduce the strain on the world's resources. As such the communities of practice in this institution demonstrate many of the characteristics embodied in Amin and Roberts (2008) classification of professional communities of practice within which the knowledge required is specialised and acquired through prolonged periods of education and training. Another characteristic is that co-location is often required but not always and the social relationships are based on the expectation of professional conduct and this in turn facilitates the development of trust between members.

Roles of participants

The community of practice examined in case A is made up of members with different roles, including Managing Consultants, with senior responsibilities for client liaison, Principal Consultants responsible for designing, developing and implementing training programmes both on-site and on clients premises. Members are geographically distributed within the UK and many work from home during the working week and attend regular face-to-face meetings at the headquarters building in London.

Members communicate using telephones and voice mail, e-mail and report, in some cases virtually to their line manager who has overall responsibility for performance.

Participants in case A identified that the degree of virtuality in their community's ways of working was relatively low.

5.2.2 Case B

This multi national corporation is in the telecommunication industry has extensive representation in many countries and is the world leader in many of its chosen markets. The company employs more than 110,000 people and works with customers in more than 180 countries. The company has been in the forefront of advances in digital and IP networking technologies that have had a dramatic effect on the development of virtual Communities of Practice as a result of better, faster and more bandwidth for ICT communications. Moreover, the technologies developed by this company have contributed to the escalating use of social networking applications and IP technologies such as VoIP, IPTV and smart phones that have facilitated the transition to the digital economy. The community of practice examined in case B has members who are geographically distributed throughout the world and across time zones, languages and cultures. They all work from home. All work is virtual nature and members communicate using telephones and voice mail, e-mail, and instant messaging and report, in some cases virtually to their line manager who has overall responsibility for performance. They complement their interactions with richer communication media, such as teleconferencing or Web-based videoconferences, in an effort to simulate some of the nuances of face-to-face encounters.

Roles of participants

The community of practice examined in case B is made up of members with different roles, including managing consultants, with senior responsibilities for client liaison, principal consultants responsible for developing and implementing training programmes, account executives responsible for selling the training programmes, training representatives responsible for training clients, often on-site, account management specialists responsible for handling customer relationships, and customer service representatives responsible for handling in-bound customer queries. Participants in case B identified that the degree of virtuality in their community's ways of working was high. As such the community of practice examined in case B demonstrates many of the characteristics embodied in Amin and Roberts (2008) classification of virtual communities of practice within which the knowledge required is largely codified and social interaction mediated through technology.

5.2.3 Case C

This company is based in Brighton and specialises in providing advice and services associated with digital transformation. The company works with many global brands and interacts with them through the use of virtual working. Members are geographically distributed within the UK and many work from home during the working week and attend regular face-to-face meetings at the headquarters building in Brighton. Much of the day-to-day work carried out is virtual in nature and members communicate using telephones and voice mail, e-mail, and instant messaging and also use teleconferencing or Web-based videoconferences, and other tools such as Slack, Salesforce.com, Basecamp, Google Docs, Microsoft OneDrive and Dropbox. These tools allow for team collaboration and communication and aid both synchronous and asynchronous communication when members are working in different locations in different time zones.

Participants in Case C identified that the degree of virtuality was medium to high. As such the community of practice examined in case C demonstrates many of the characteristics embodied in Amin and Roberts (2008) classification of expert/creative communities of practice within which communication is facilitated through a combination of face-to-face and technology interactions.

Roles of participants

Once again the participants in Case C were made up of members with different roles, including CEO, Head of Client Services, Head of Data, Head of Business Development, Project Manager, Developers

5.3 Summary

Each of the case studies have provided an ideal example of how digital connectivity has enabled the rise of virtual working in work based organisations. Moreover, the case studies have enabled the study to examine the implications for the Communities of Practice concept - most often associated with Lave and Wenger's ground-breaking work on situated learning (Lave & Wenger, 1991). This has facilitated a better understanding of how members of Communities of Practice members are able to adapt and cope with the issues associated with virtual working.

Chapters six and seven present the research findings in relation to the questions examined in the case studies based on the interviews in the study and sets out the emerging themes.

Chapter 6 Research Findings – Elements of Virtuality and the Fertility of the Learning Environment

“Social capital may turn out to be a prerequisite for, rather than a consequence of, effective computer-mediated communication.” Putnam, R. D. (1995).

6.1 Introduction

As previously identified, this study uses the lens of virtual working to critically examine the theory of situated learning introduced by Lave and Wenger in 1991. Situated learning theory has proved to be a powerful way of thinking about the way in which knowledge is created and shared and the community of practice concept is one of the theory's core concepts. This study's main driver is to examine how the theory of situated learning can be used to help understand learning as applied to communities of practice working in a globalised virtual environment. The original theory took a social constructivist view on learning and knowledge creation, arguing strongly that the social context in which learning takes place is of prime importance and that the cultural and historical setting is a fundamental element of how learning occurs. In short, learning occurs within an environment that is conducive to knowledge creation and as new knowledge is developed the social setting in which it takes place is transformed (Wenger, 1998:13). The key feature of virtual working is that it changes the emphasis from face-to-face communication and physical co-location to one of face-to-screen communication where actors interact through technology and use boundary objects – both virtual and physical – with which to interact, negotiate and create and share knowledge. This thesis will investigate the implications of this change for the fertility of the environment in which communities of practice operate.

Interviews were conducted with a total of 30 members, including managers, of the three communities of practice. The procedure for selecting participants was that of purposive sampling thus allowing for the researcher to make the decisions regarding the choice of interviewees.

In order to explore the theme related to step 1, each interviewee was asked the following question.

“Virtual working means that one or more of the following elements are present: Dependence on ICT, distributed location, national, cultural and language diversity, time differences and fluid membership and structure. Please can you comment on the implications of these from your perspective and how you feel that these factors influence the working environment for problem solving and creativity?”

6.2 Presentation and interpretation of findings

This section sets out the findings and provides relevant quotations from participants together with an interpretation of their responses and the insights that arise from them. References to the literature review are given as appropriate.

The empirical findings indicate that communities of practice can exist on a spectrum from co-located with low degrees of virtuality to entirely virtual with no co-location and that actors can respond to this in quite different ways along this spectrum. It is a given that virtual working necessitates the use of technology to communicate between members of a community of practice and all the interviewees depended to some extent on ICT to communicate with each other. The most common examples of this are the use of email and telephone. The use of texting is also becoming more prevalent through tools such as SMS and Whats App. In circumstances where virtual meetings are required participants stated that videoconferencing is increasing in use, as are applications such as Google Hangouts and Skype, which simulate face-to-face encounters.

The study identified three main stages from co-located to virtual based on the extent to which communities conduct regular face-to-face meetings, as this reflects the degree of dependence the community has on technology to mediate interactions. Each of these phases can help identify the differential implications of virtual working as will be seen in this and subsequent empirical chapters. This enables a classification to be developed for communities of practice in each of these stages. Communities of practice that conduct face-to-face meetings on an at least monthly basis can be considered to have a low dependence on ICT to mediate their interactions; communities of practice that conduct face-to-face meetings on an at least a quarterly basis can be considered to have a medium dependence on ICT to mediate their interactions and those that conduct face-to-face meetings on less than once a quarter basis can be considered to have a high dependence on ICT to mediate their interactions.

Table 6.2 below summarises this.

Table 6.2 Classification of CoPs based on stages of virtuality spectrum. Developed by the author	
Type of VCoP	Features
Phase 1 - Low IT reliance	<ul style="list-style-type: none"> • Conduct face-to-face meetings on an at least monthly basis • Low degree of geographical distribution, diversity, language, culture and time differences
Phase 2 - Medium IT reliance	<ul style="list-style-type: none"> • Face-to-face meetings are on at least quarterly basis • Medium degree of geographical distribution, diversity, language, culture and time differences
Phase 3 - High IT reliance	<ul style="list-style-type: none"> • Face-to-face meetings are held less than on a quarterly basis • High degree of geographical distribution, diversity, language, culture and time differences

6.3 Emergent themes

The findings suggest that increased virtual working has the effect of weakening the social relationships which are the building blocks for knowledge creation and sharing in co-located communities of practice. The evidence presented indicates that the composition of the building blocks contributing to the fertility of the environment for knowledge creation changes as the community moves towards the third stage of virtual working as the strength of social relationships is diluted and the opportunities arising from weaker ties become more prevalent.

Analysis of the data highlights how virtual working can act both as an inhibitor and an enhancer of learning and knowledge creation. These perceptions are influenced by the extent to which participants are dependent on the use of technology and the associated elements of virtuality. The nature of members' roles and the way work is organized are other factors contributing to the sense of ambiguity amongst participants with respect to the opportunities and challenges of virtual working.

The findings are set out below in two main categories based on the perceived opportunities associated with virtual working and the perceived challenges in relation to virtual working.

6.3.1 Opportunities

A majority of participants in medium to high ICT reliant Communities of Practice in all three cases considered themselves to be more "tech savvy" and felt that the development of more collaborative technology is having a bigger impact on the richness of communication, especially as they believe that the tools are now so much more "intuitive and easy to use". In undertaking the empirical research the author identified the use of a number of tools being used, including Slack, Salesforce.com, Basecamp, Google Docs, Microsoft OneDrive and Dropbox. These tools allow for team collaboration and communication and aid both synchronous and asynchronous communication when members are working in different locations in different time zones. The interviews indicated that participants in communities of practice with higher virtuality tended to have a higher degree of motivation to embrace virtual working. These participants perceive that the use of technology with enhanced functionality facilitates learning and knowledge creation rather than inhibits it.

An example, of this belief is the following quote from the Head of Leadership Development in Case B.

“Technology plays a big part and recent developments make the virtual more real. Improvements in technology reduce communication barriers. It’s the enabler.”

The use of video tools such as Slack, Skype, Google Hangouts and Adobe Connect to facilitate interaction is increasing, and participants stated that communication is simulating face-face encounters much more closely. This helps to build trust, as the extent to which actors engage in face-to-face contact is an important factor in building trust (Kirkman et al 2004).

Trust can be defined as the degree of willingness actors have *“to be vulnerable to the actions of another party based on the perception that the other will perform an action important to the trustor”* (Mooradia et al. 2006; p524). This in turn can depend on whether trust is either *cognitive based* (McAllister 1995) and related to an appreciation of the competence of another actor based on their track record or reputation; or is *affect based* (McAllister ibid) and based on the strength of the social relationships between the actors. In the context of virtual working trust can enhance the fertility of the environment and leads to a higher level of willingness to share knowledge and engage enthusiastically in virtual interactions. This finding resonates with the work of Ardichvili, Page and Wentling (2003) in their study on the motivation and barriers to participation in virtual knowledge-sharing communities of practice. This qualitative study, which examined three virtual communities of practice in Caterpillar Inc, identified that the conduciveness of the environment in relation to issues associated with trust impacted on the extent to which members were motivated to contribute to knowledge sharing.

A majority of participants in communities of practice in phase two and three on the virtuality spectrum generally felt that greater geographical distribution presented significant benefits as it opens up the possibility of new ways of learning to emerge, which are not dependent on the need for strong relationships with existing members in a co-located scenario. This is demonstrated in the quotes below:

Senior Learning Consultant in Case B: *“Virtual working provides the ability to be in contact with a much more diverse group of people than you can with co-location so this can aid the process of getting and sharing ideas and thoughts with far more people.”*

Developer in Case C: *“It’s important to have a range of different people - so we need to include those with whom we may not have a long standing relationship. This helps to keep the ideas fresh and new.”*

This implies that in these communities of practice, moving from a tighter and more closed community, where learning can be associated with the “master and apprentice” concept embodied in Lave and Wenger’s (1991) legitimate peripheral participation, to a looser and more open and networked grouping of individuals is a feature of virtual communities of practice as the degree of virtuality increases. As will be discussed in the following empirical chapter, the nature of the social relationships that exists between actors changes as the community operates at higher degrees of virtuality. These relationships are based on weaker ties rather than on the strong bonds, which are a feature of co-located communities of practice. This phenomenon is common in each of the cases in the study. Another feature noted during the interviews is that more “user-friendly” technology increases the likelihood of effective deployment for the purposes of learning and sharing of knowledge, as actors are more confident in the use of the tools. Many participants commented that using some of the more collaborative tools to mediate interactions has significant advantages over face-to-face meetings. These include the belief that there is less talking over each other in virtual encounters than in face-to-face meetings.

The following quote from relatively a new Consultant in Case A is illustrative and consistent with views of the majority of participants in this case.

“Virtual working means we can be more democratic, especially with chat boxes. This helps with people with less confidence. It’s also much faster and provides traceability in terms of who said what”.

The quote below from the Head of Business Development in Case C is also indicative of this view.

“More collaborative tools – such as slack and Google hangouts help to generate rapport and work closely with people who are remote and helps to limit sense of alienation and brings smart people together.”

This highlights the fact that ICT is moving from being perceived as a tool for storing and manipulating information to a means of sharing and collaborating and in these circumstances contributing to a more conducive environment for knowledge creation within which new ways of learning are emerging. This extends beyond the technological tools designed to increase productivity and efficiency for the organisation of social media tools, which facilitate social interactions as well as work related ones. In this way the theory of situated learning can be extended beyond the boundaries of a physical co-location.

A majority of participants in all cases perceiving positive effects associated with virtual working, commented that creative problem solving increases in communities whose members have heterogeneous skills, diverse backgrounds and experiences. Unique contributions by individual members increase the likelihood that a community of practice will benefit from dynamic cross-cultural interaction.

This is demonstrated in the following quote from a Senior Learning Consultant in case B.

“Virtual working enables contact with wider groups. So we can get new information from those with whom we do not know well. This is a major benefit of virtual working.”

A pattern begins to emerge within these communities of practice that point to new ways of learning. As virtuality increases, actors find themselves in significantly larger groups with a greater diversity in terms of fellow members and increased plurality and heterogeneity of knowledge, with more opportunities for creativity and innovation as a result. This insight is consistent with the study undertaken by Chamakiotis, Dekoninck and Panteli (2013) examining how the increase in virtual working influences creativity. Moreover, the prevalence of fluidity of structure is felt to be higher in communities where the reliance on ICT is higher and the associated elements of virtuality are felt more deeply.

Fluidity of structure often means project-related work with frequent changes in the shape and size of the community and the nature of the work on which the members are engaged. The interviewees indicated that whilst members of these communities might have little identification with the group as a whole, temporary membership could be seen as a positive factor as demonstrated in the quote below from a senior consultant in Case B.

“Temporary nature of the groups can help because we can get down to work straight away rather than engaging in social chit chat. Motivation to interact is more related to the task or the work rather than in relationship.”

This is an interesting insight, which indicates that the motivation to interact in communities of practice with medium to high degrees of virtuality is more related to the task or the work rather than in developing a strong socially driven relationship. This finding extends the study undertaken by Marabelli, Rajola, Frigerio and Newell (2013), showing how group membership in virtual communities can be goal-oriented, project based, temporary, with a group structure that evolves rapidly. The study highlights how virtual working can facilitate the informal interaction between people to generate new knowledge. Moreover, as Memmi, (2006) posits, these informal communities are characterised by infrequent interactions, temporary membership, large numbers of people, and little identification with the group as a whole.

Moreover, they tend to identify with an idea or goal, rather than relate to group of people in a physical location. In extending Memmi’s work, this study’s findings indicate that the transition towards higher levels of virtuality is associated with a greater degree of individualized learning and transactional interactions.

Many participants in all cases B and C commented that where the degrees of virtuality are higher the opportunities for knowledge creation can be increased provided care is taken to ensure that information is communicated in a timely fashion and understood by actors in a common way. The following quote from the CEO in Case C is an example of this belief.

“Virtual working means we must be more explicit about agenda and keep things more precise and less open-ended. Also, we need to work harder on explaining the purpose of what we are doing than when co-located.”

The greater pressure to structure and codify knowledge suggests that virtual working requires a more “objectivist perspective” with greater emphasis on explicit knowledge which is seen as separate from individuals and social value systems.

This is in contrast to the “practice-based perspective” which emphasises tacit knowledge and represents a more contextual knowledge base that cannot be detached from the individual actors and is inherent in situated learning, (Orlikowski 2002, Nicolini 2004.

Ghearrdi 2006, Corradi et al. 2010).

6.3.2 Challenges

The empirical findings have revealed a number of challenges associated with virtual working, particularly in communities of practice in with low levels of virtuality whose members take a more negative view and feel that over reliance on technology can be problematic. This perception is demonstrated by the following quote from a Principal Consultant in Case A.

“The technology needs to be adopted by all and embraced so we are all on the same page. Also it needs to be stable otherwise it can be very frustrating.”

This sense of frustration adversely impacts on the conduciveness of the environment with respect to learning and is an inhibitor to knowledge sharing. The interviews identified that a significant number of participants in this category indicated that the increasing proliferation of tools that are intended to improve collaboration left them with a sense of confusion and some mentioned that they felt overwhelmed by the range of tools now available. This could well influence the extent to which people are confident in ICT. It is clear from the discussions that confidence in the use of ICT is an important consideration as low confidence leads to lower motivation to embrace the use of technology and inhibits actors from moving further along the continuum of virtuality especially if they believe that weak relationships are essentially superficial and of little value. In these circumstances the findings show that actors take steps to minimise the use of the technological tools available. In many cases this is done with passive resistance to attempts by the organisation to introduce more sophisticated technology, as pointed out by Ardichvili, Page and Wentling (ibid). In this sense, the power dynamics within a community and the wider organisation can be played out and create challenges for knowledge creation and sharing. The issue of power is further examined in the next sub-section.

Technology and surveillance

The empirical findings demonstrate that in circumstances where the technology platform is imposed by the organisation, resentment can result and lead to a barrier to learning particularly amongst those not holding managerial positions. This is partly because of fears of the enhanced capacity of an organisation to monitor staff has been facilitated by the digital transformations that have taken place in most workplaces. A significant number of participants in all phases of the virtuality continuum and in all cases felt that the issue of surveillance is of growing concern. This finding is one that is reflected in all the cases. The following quote from the Head of Operations in Case A exemplifies this view and is reflective of those in all cases.

“When the technological platform is imposed by the organisation, some feel threatened and adopt their own, personal means of communication to avoid senior management scrutiny.”

This feeling is echoed in the Trades Union Congress (TUC) report *“I’ll be watching you”* published in August 2018 that highlights this concern. The report points out that 56 per cent of workers in Great Britain believe that it likely that their employer is using technological means to monitor them, both in and out of the work place. Furthermore, 70 per cent think that surveillance is likely to become more common in the future. Participants in the study echoed these concerns and fear that the nature of the surveillance could include monitoring emails and browser history and/or files saved on work computers as well as browser histories on personal devices that are on connected to the organisations’ Wi- Fi network. Further fears extend to the use of social media outside of working hours, such as monitoring the posts on personal Facebook or Twitter accounts.

As Brendan Barber, former TUC General Secretary stated:

“Monitoring employees’ behaviour through computer systems is a growing concern across the workforce. Although employers can have legitimate concerns about staff accessing inappropriate material and excessive time spent social networking, a heavy handed reaction causes unnecessary stress and weakens morale.”

The findings indicate that these concerns lead to the undermining of trust, motivation and job satisfaction. This perception is also reflected in Newell (2015), emphasising how the rapid developments in technology, particularly in social software, are creating significant implications for how organisations can manage both knowledge and knowledge work. Participants who shared this perception mentioned that they resist the notion of ‘big brother’ and seek to develop alternative means of communication. The above discussion underlines the fact that a community of practice concept can be framed through a constructivist approach, which incorporates agency of the members, and this is an example of how attempts to resist surveillance and codification of their knowledge are examples of this exercise. Moreover, this also illustrates that social media tools can be a double-edged weapon for managers and knowledge workers. Interviewees stated that they would use their own personal and direct methods of interacting to avoid the risk of management accessing and monitoring the content and nature of their communications. This approach is a means of seeking to change the power dynamics in the workplace between the organisation and its knowledge workers.

Participants strongly believe that the issue of surveillance and monitoring in the workplace contributes to the creation of an atmosphere of fear and distrust, which undermines the conduciveness of the environment for learning and the sharing of knowledge. The ability to use their own subversive and covert means of communicating contributes to a feeling of freedom and empowerment and a sense that they can be more honest and less formal in their style of interacting and this in turn makes for a more fertile climate within which knowledge creation and sharing can be enhanced as members interact more freely with less fear of monitoring by the organisation. As the Director of Consultancy in Case A commented:

“One of the things about technology is you have to accept the official system imposed by the organisation but there are also the informal platforms which people set up on their own – eg Facebook, What’s Ap. People can be more open and honest with the informal ones and resist the idea of the ‘big brother syndrome.’ People prefer to use their own shadow, or subversive ones. Eg Skype, MS Link etc.”

The empirical findings indicate that when actors feel coerced into using a particular technology platform they may well lose confidence in the motives of the organisation and turn to the use of “*subversive*” technological tools to facilitate their interactions. This perception may well be accentuated by the fear of de-skilling, which can be linked to labour process theory, (Braverman 1974). The loss of confidence and the associated issues of trust can have profound implications for the way in which virtual working impacts on the fertility of the environment for learning and knowledge creation in communities of practice and can undermine the social construction of knowledge.

Geographical distribution

The use of technology to mediate interactions is synonymous with distributed geographical locations and a majority of participants indicated that the effect of this could be to miss out on the informal, everyday spontaneous encounters, which often trigger the creation of new knowledge. Most participants indicated that virtual members can go days without contact, leading to feelings of isolation which hinders innovation and effectiveness. This can be linked to lost opportunities to see other people in their own work context, which could lead to misunderstandings due to lack of awareness of the local context and the failure to spot tacit knowledge elements. As knowledge is socially constructed, (Lave and Wenger, Situated Learning, 1991; Vygotsky, Zone of Proximal Development, 1962) the extent to which social encounters are inhibited can limit knowledge creation.

The study participants pointed out that the implications of distributed location are often associated with the question of approachability and accountability. Many non-managerial participants felt that some more senior people were less accessible in virtual situations. Interviewees commented that senior people can 'hide' and this can be frustrating and get in the way of sharing knowledge and solving problems. This reflects the finding made earlier about the potential for technology to be used as a means of surveillance and thereby further distorting the balance of power. The following quote from one of the more experienced Principal Consultants in Case A is an example of this perception:

“Power imbalance can cause problems. If one person feels they have more power they may not respond so readily as a new or less senior person.”

This can result in the feeling that whilst the manager can monitor the activities of the junior member through the use of technology that the manager can "hide" behind the cloak of virtuality and not respond to requests for contact and this is seen as an example of power imbalance. This phenomenon is particularly evident where geographical distribution makes it difficult for a junior member to physically meet the manager.

Geographical distribution often means actors are working across different time zones, languages and cultures. Interviewees felt that the conduciveness of the environment for knowledge creation and sharing can be impacted in situations where geographical distribution leads to members of the community being located in different countries as different cultures are likely to prevail even when the language is common. National differences can lead to different ways of thinking feeling and behaving and inhibit the development of common ways of working that are so necessary for the development of mutual engagement. The issue of knowledge sharing in communities of practice is strongly linked to the work contexts in which members operate and which differ on the basis of their language, the locus of their practice, and their conceptualisation of their work and this can impact on the fertility of the environment in respect to learning. In other words, knowledge is rooted in the work itself and at the same time in those that undertake the work.

Conflict resolution could also be problematic as national identity can lead to a difference in world-view and associated misunderstandings, which can inhibit the ability to reach consensus and resolve conflicts. Language differences inhibit effective communication and make it difficult for people to work together and meet their objectives. The extent to which the barrier can be overcome is dependent on the level of language skills of the people involved in the community. Participants felt that in meetings of cross-lingual communities language becomes the dominant factor. Because different actors can interpret language in different ways, it can lead to different conclusions being drawn on the basis of what has been heard, and can have significant consequences for the cohesion of the community and its effectiveness in relation to knowledge creation. Several participants commented that accents could be very difficult and that there is a need to be aware of colloquialisms and jargon that do not translate very well. This leads to the need to take greater care to speak more plainly.

This is a factor that co-location can contribute to more easily than in dispersed groups and therefore an aspect of learning which can be made more problematic as a result of virtual working as can be seen from the quote below from one of the Head of Client Development in Case A.

“Accents can be very difficult sometimes. I have colleagues in India and I often have to ask people to repeat.”

This issue is made more acute by the contestable nature of knowledge which stems from the fact that it is socially constructed and rooted in the culture of the community in which it is created, this makes it challenging when it is being interpreted by others from a different culture and represents another implication of virtual working for the fertility of the environment. Furthermore, the findings show that when dealing with issues that are more complex, different language and cultural norms make this more difficult. This is because it is often the case that people take longer to process information when not using their own mother tongue and can cause delays in the communication process and frustration amongst members as a result. This can inhibit the development of common ways of working necessary for the development of mutual engagement. Complexity of issues may be affected by use of language and cultural norms. Several participants commented that written information (asynchronous) is easier than when speaking especially if it is a complex issue as thinking and talking at same time slows down the process the information. The following quotes from two senior managers in Case B are examples of this perception.

Head of Leadership Development: *“Different national cultures lead to different ways of thinking, feeling and behaving and this can make it more difficult to develop and to share common understanding of the issues being addressed. It is often easier to communicate when the issue is less complex.”*

Senior Learning Consultant: *“We need to be more enquiring and probing rather than demanding and particularly if it is a more complex problem. This requires being a lot more careful and mindful and awareness of others’ culture has a huge part to play as people can feel alienating and isolated if they don’t understand.”*

Actors relate to each other through the filters of their own individual styles and preferences and place a higher emphasis on their personal and social needs than on those of others and the organisation. This places the issue of trust as a paramount requirement. Members have to trust the people and process and the managers and the organisation. Moreover, members have to be willing to contribute to the common discourse and be willing to engage in constructive conflict on the work itself in order for the environment to be conducive to knowledge creation and sharing. This is particularly important in groups with cultural diversity as trust is essentially associated with perception, which in turn, flows from the 'software of the mind', (Hostede, 1991), the effect of culture on the issue of trust can be quite profound as different cultures have different norms around issues associated with trust. These are factors that can adversely impact on the extent to which the environment is conducive to knowledge creation, which in turn has implications for the theory of situated learning. This is demonstrated in the quotes below from the Director of Consultancy in Case A.

"Need to be very clear as it is possible for misunderstandings to occur and take things out of context. Need to be more aware of the other's culture. Trust can be harder to build with different cultures. It is possible that things can be misunderstood and to take things out of context. We have to very careful with some people who are culturally less assertive and more passive so it can be difficult to really understand them and so when dealing with more complex projects we need to take greater care. Language can be problematic and can present barriers to communication especially if there is difference in the mastery of language."

In these circumstances the codification of knowledge which has been previously tacit in nature is necessary to ensure the creation and sharing of knowledge. The findings underline the fact that knowledge can be seen to be cultural dependent and difficult to understand when those actors creating the knowledge are from a different culture to those actors who are interpreting the knowledge as argued by Weir and Hutchins (2005). The fact that knowledge is socially created relates to both the way it is both constructed and the way it is construed, as argued by Polanyi (1969) who referred to these two processes as 'sense giving' and 'sense taking'. This emphasises the challenges associated with converting tacit knowledge to explicit.

The findings also indicate that working across time zones to coordinate meetings is one of the most challenging issues in relation to virtual working, as demonstrated by the following quote from a Developer in Case B.

“The most challenging is the time difference issue. Need to respect people and not have same people work in the evening or early morning.”

Temporal distribution can lead to asynchronous communication resulting in people receiving information at differing times. Interviewees felt that this led to frustration and resentment and a sense of isolation and alienation amongst those who felt that they were not as much ‘*in the loop*’ as those who are geographically closer together. Many participants indicated that these feelings of frustration and resentment are magnified when language and cultural diversity were also prevalent. This was linked to a potential for geographically distributed members paying less attention with the associated possibility of more freeriding where some actors can be perceived as taking more than they are giving in relation to knowledge sharing and can lead to resentment amongst other members. Several participants also commented on the issue of work life balance associated with time differences. This indicates that distribution in terms of geography, language, culture and time can inhibit knowledge creation as the socially constructed nature of knowledge is inhibited by reduced opportunities to collaborate.

The extent of complexity of the issue being dealt with by the members of the community is an associated factor raised by participants as the following quote from a Principal Consultant in Case A demonstrates.

“We need to be a lot more careful about others and their sensibilities especially those that speak a different language. Thinking and talking at same time slows down the process of information sharing especially if it is a more complex problem.”

Fluidity of membership represents an additional challenge and many participants commented that virtual working is more likely to be characterised by people coalescing around a specific project related goal or objective, which means that the membership will change when the, often temporary, structure is no longer relevant.

Participants felt that forming good relationships is very difficult in situations where the membership of the community changed frequently.

Furthermore, senior people interviewed indicated that planning new knowledge creation and sustaining organisational memory is also a significant challenge when members come and go on a frequent basis. This perception is illustrated below in a quote from a Senior Learning Consultant in Case B.

“Temporary membership can get in the way as you often find that people come and go very quickly and new people suddenly arrive and so you have to start all over again with getting them up to speed.”

6.4 Summary

This chapter has synthesised the empirical findings based on the perceptions of interviews as to how the fertility of the environment and its conduciveness to knowledge creation is influenced by the elements of virtual working. The findings indicate strongly that there is a significant degree of ambiguity in respect of how communities of practice are affected by reliance on ICT and the associated elements of geographical distribution, diversity of language and fluidity of membership and structure. This ambiguity reflects the complexity of how learning and knowledge creation takes place when impacted by virtuality. Situated learning theory is based on shared values, identity and common worldview. However, this study has highlighted that new factors emerge in virtual communities making the process of knowledge creation more complex.

The following chapter presents further empirical findings based on the research questions examining how the strength of social relationships is influenced by virtual working and the associated impacts on the development of the *practice*, the sense of togetherness necessary for a meaningful *community* to exist and the process of legitimate peripheral participation.

Chapter 7 Research Findings - Strength of social relationships and impact on practice, community and legitimate peripheral participation

“If people who have to work together in an enterprise trust one another, it is because they are all operating to a common set of ethical norms.... such a society will be better able to innovate...since the high degree of trust will permit a wide variety of social relationships to emerge” Fukuyama, F. (1992).

“When it comes to finding out about new jobs - or, for that matter, new information, or new ideas - "weak ties" are always more important than strong ones.” Granovetter, M (1983)

7.1 Introduction

Chapter six has analysed the community of practice members’ responses with regard to the way in which the fertility of the environment for knowledge creation is influenced by the elements of virtual working. An insight to emerge from this analysis is that there exists considerable ambiguity in responses with respect to how learning and knowledge creation takes place when impacted by virtuality in communities of practice. These perceptions can be categorised in two major groupings; actors who tend to hold a positive view of virtual working, embrace its implementation and see the opportunities for learning through the medium of technology; and actors who tend to perceive more challenges associated with virtual working and resist its adoption. The purpose of this chapter is to present and analyse the perceptions of these two categories of participants through the theoretical lens identified in the research design set out in table 7.1 below.

This chapter will also unpack how the strength of social relationships is influenced by virtual working and the associated impacts on the development of the *practice*, the sense of togetherness necessary for a meaningful *community* to exist and the process of legitimate peripheral participation.

Table 7.1 Steps in the research design. Developed by the author.	
Steps	Elements A study of the perceptions of community of practice members based on semi-structured interviews.
Step 1	How members feel about how the fertility of the environment and its conduciveness to knowledge creation is influenced by the elements of virtual working
Step 2	How the elements of virtual working influence the importance of strong social relationships How the strength of social relationships affect the notion of practice How the strength of social relationships affect the notion of community How the strength of social relationships affect legitimate peripheral participation

Since the knowledge and knowing generated in a community of practice is considered to be embedded in a specific situational context (Lave and Wenger, 1991), the creation and sharing of this knowledge in a distributed context raises new uncertainties that can be problematic for our understanding of learning. This is the issue that provides the foundation for the interview questions, which explore how social ties are impacted when actors are spatially and temporally distributed and dependent on technology to mediate their social interactions. There are four themes that have been explored in this stage of the interviews, as set out in the research design. Each interviewee was asked the following questions:

- *“In what ways does virtual working affect the strength of social ties in communities of practice?”*

- *“In what ways do social relationships in virtual communities of practice impact on the notion of practice?”*
- *“In what ways social relationships in virtual communities of practice impact on the sense of community?”*
- *“In what ways do social relationships in virtual communities of practice impact on the process of legitimate peripheral participation (socialisation of new members)?”*

7.2 Classification of virtual communities of practice

This section builds on the classification developed in the previous chapter, and demonstrates that there are different features regarding social ties based on the degrees of virtuality and these are summarised in table 7.2 below.

Table 7.2 Classification of stages of virtuality impact on social relationships. Developed by the author	Features
Low stage of virtuality	<p>Strong social ties exist and facilitate knowledge creation</p> <p>Close proximity aids knowledge creation and sharing</p> <p>Low impact on the concept of <i>community</i>, sense of togetherness</p> <p>Low impact on legitimate peripheral participation as proximity facilitates observation and tacit knowledge transfer</p>
Medium stage of virtuality	<p>Social ties are being diluted and learning is becoming less dependent on strong relationships</p> <p>Development of practice depends on some face to face encounters to facilitate mutual engagement, shared repertoire and joint enterprise</p> <p>Sense of community can be weaker as there are fewer face to face encounters</p> <p>Higher impact on legitimate peripheral participation as fewer opportunities for observation and tacit knowledge transfer</p>
High stage of virtuality	Social ties are weaker and are not considered necessary for

	<p>knowledge creation</p> <p>Weaker ties more beneficial as they introduce a greater plurality of knowledge</p> <p>Networked grouping of individuals coalescing around a common aim rather than strong sense of togetherness</p> <p>LPP more difficult to achieve and requires increase in volume and quality of explicit and codified knowledge</p>
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The table shows that, according to respondents from each of the three cases, increased levels of virtual working lead to the dilution of strong social relationships with shared values, identity and common world view each of which are the building blocks for knowledge creation and sharing in co-located communities of practice, (Brown and Duguid, 1991; Lave and Wenger, 1991). Respondents also pointed out that virtual working creates the possibility of accruing the benefits of weak-links (Granovetter 1973-1983) and these facilitate the flow of heterogeneous knowledge as the community moves further along the virtual working spectrum. The analysis indicates that distributed ways of working driven by the exogenous pressure of globalisation and the increasing prevalence of the use of technology to mediate interactions, leads to the establishment of weaker relationships between actors. Moreover, these weaker links tend to lead to less emphasis on the co-construction of knowledge and to promote more transactional forms of learning in which actors exchange their knowledge with others on an individual basis.

As chapter six has identified, there are contradictory views amongst respondents with respect to the importance of strong social relationships for the fertility of the environment for knowledge creation. Some participants perceive opportunities associated with the weakening of social links whilst others perceive challenges.

This ambiguity extends to the perceptions relating to the impact on *practice* and *community* and on the process of *legitimate peripheral participation*. These views are analysed below in respect of each of the four themes examined by the questions listed above.

7.2.1 The strength of social relationships

The research has been designed to examine the implications of virtual working for the theoretical assumptions underpinning Lave and Wenger's (1991) concept of a community of practice. These assumptions include strong social relationships characterised by co-location, high frequency of interaction and enduring over time with the associated features of high trust, common reciprocity and regular communication. As explained in earlier chapters, a community of practice is a social locus for learning in practice, (Lave and Wenger, 1991; Brown and Duguid, 1991; Wenger, 1998). Lave and Wenger's (1991) concept of a community of practice places much emphasis on the need for strong social relationships in the creation of knowledge. Situated learning theory posits that knowledge is co-constructed by actors situated in a specific context and embedded within a particular social and physical environment with a high degree of co-location and strong social relationships.

As chapter six suggests, the participants responses indicate that the increasing prevalence of virtual working means the nature of communities of practice is changing from a largely co-located group with a higher degree of physical proximity and associated strong social relationships, to groups of people relying on technology to mediate their interactions and working with varying degrees of virtuality. As a consequence, work activities are far more dispersed and organisations regionally fragmented than was hitherto the case. This has the effect of weakening the social relationships that underpin learning and knowledge creation in co-located communities, whilst at the same time making it possible to derive the benefits of weaker links by opening up new pathways for learning to take place. As a result situated ties break down and weaker ties emerge as reliance on ICT increases and geographical distribution becomes deeper and wider. Communities with high ICT dependence and wide geographical reach are able to access knowledge from a wider group of people and this greater diversity increases the flow of new knowledge, which is more difficult in a more tightly knit group with strong relationships.

The findings from chapter seven identify that a higher degree of heterogeneous knowledge can be created in circumstances where actors have weaker links.

In addition, higher degrees of virtuality are associated with a greater degree of fluidity in the structure and membership of the community. A more dynamic and unstable structure contributes to the emergence of new ways of learning which flow from accessing knowledge from a far more diverse range of actors and locations than is possible with lower degrees of virtuality. These findings indicate that virtual working enables actors to interact and create knowledge with less emphasis on strong ties, which within an organisational setting can occur in more prescribed relationships and the associated degree of hierarchy embedded in the notion of community. Moreover, it was noted in discussions with participants how virtual working suggests that the sharing of common goals has primacy over social relationships in respect of learning and knowledge sharing. The quote below from an experienced Senior Learning Consultant in Case B is an example of this perception.

“I often work virtually on temporary projects and this enables contact with wider groups. So I can get information from others as well as those with whom we have strong ties. This is a major benefit of virtual working.”

Studies undertaken by Memmi, 2005; Kimble and Hildreth, 2005; Murillo 2005; Dubé et al., 2005; Correia et al., 2009 also all suggest that virtual communities consist of more diverse actors than is the case in co-located communities.

These insights appear to echo Granovetter’s (1973; 1983) central point that weak ties create bridges, which provide actors with more and shorter paths to heterogeneous information. Thus, it can be argued that the effects of the dilution of strong social relationships in relation to knowledge creation can be ameliorated by Granovetter’s (ibid) “*strength of weak ties*” concept and this, in turn, creates opportunities for new knowledge to emerge.

As set out in the previous chapter, participants operating at lower degrees of virtuality perceived more challenges associated with virtual working, place great value on strong social relationships and suggest that it is easier to build stronger ties in communities with higher co-location and lower dependence on ICT. This was based on the fact that co-location facilitated communication.

During the interviews with participants with lower degrees of ICT dependence it became clear that, in their opinion, strong social relationships make it easier to deal with the tensions and conflicts that arise as part of the pressure of modern day workplaces and which can be quite debilitating if not addressed. The following quotes from Principal Consultants in case A are typical of this perception.

“Social ties need to be strong. People relationships can grow as a result of virtual working but we need to meet physically from time to time.”

“People feel more comfortable to share their ideas when they feel that they can trust others, so relationships are important.”

“Reciprocity can be only with those with whom social ties are stronger. People can form coalitions with those they know best and with whom they have a stronger relationship”

The discussions identified the belief amongst participants with low degrees of virtuality that virtual working can undermine the strong social relationships that they consider to be an important element for communities of practice. Furthermore, it was noted that as the degrees of virtual working increase, the perception held by these participants is that strong social relationships become more difficult to build and that this can have an adverse effect on knowledge creation and knowledge sharing. Using technology to communicate reduces the need for co-location, and this in turn can reduce the strength of social relationships that flow from closeness and frequency of interaction. These factors interact to contribute to a resistance to increasing levels of virtuality as they perceive that greater reliance on the use of ICT actually weakens rather than strengthens social interaction. This makes people more dependent on technology. The interviews therefore demonstrate the complexity that arises as the community moves from a co-located close-knit group to a new type of open and more networked collection of empowered individuals who are geographically distributed, with a high incidence of temporary project work and with a tendency to communicate and interact in a more transactional way.

A similar point is made by Bates (2014), who claims that digital technology has contributed to a working environment that is more complex and ambiguous than before, and in this work context the bonds within communities of practice can be made looser and less exclusive and this in turn can contribute to a new type of knowledge creation.

This complexity is accentuated by the fact that as the degree of virtuality increases, actors have access to groups with far more members and greater diversity in terms of plurality and heterogeneity of knowledge. The physical, temporal, and psychological separation associated with virtuality means that actors are less rooted in their immediate context and less connected to each other. This facilitates the development of more diverse and broad networked based communities of practice providing opportunities for new, more open ways of learning to develop. In these circumstances actors are increasingly deploying richer communication media, such as teleconferencing or web-based videoconferences, as a means of simulating face-to-face encounters and reducing some of the drawbacks of virtuality associated with the absence of body language and other non-verbal aids to interaction. In addition, more attention is taken over the process of communication to minimise misunderstandings.

Therefore, the empirical findings confirm that the phenomenon of virtual working changes the nature of that environment within which knowledge creation takes place. In communities with low virtuality the learning environment is based on the informal conventions that facilitate communication and are largely built on tacit and organisationally specific cultural norms. The evidence presented from the interviews suggests that as the degree of virtuality increases, new ways of learning emerge based on more explicit and codified rules of engagement, which provide a structure for deriving the benefits of the weak ties, referred to above. These new protocols help to create a more level playing field for communication with dispersed and heterogeneous actors. However, as identified in chapter four, the contrasting responses suggest that these protocols, rather than replicate the conditions for the co-construction of solutions to complex problems within close-knit groups, may facilitate solutions to problems more easily addressed through codified steps or algorithms.

7.2.2 The notion of *practice*

As described earlier in this thesis, the notion of *practice* can be described as the ways of working that are shared between the members of the community. A practice forms when people coalesce to “*participate in an activity system (practice) about which participants share understanding concerning what they are doing and what that means in their lives and for the community*”(Lave & Wenger, 1991; Wenger, 1998). Those that engage in the practice form a group of “*people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis*” (Wenger et al., 2002,). In this sense practice is generally work-related, focusing on a professional activity, skill, or topic (McDermott, 2000a). Engagement in practice is the vehicle for learning and, in turn, learning is one of the consequences of that engagement.

The common theme emerging from the studies by the scholars referred to above is the strong collaborative element in the way in which problems are solved and knowledge is developed, thus emphasising that strong social relationships are required between members engaged in the practice. However, underlining the ambiguity identified in chapter four, the degree of closeness can also inhibit broad knowledge creation, a point made for example by Burt’s (2002) work on redundancy of knowledge in networks without structural holes. This is due to the high degree of homogeneity in terms of the knowledge that can emerge within a close community. In the discussions with the participants operating with higher degrees of virtuality it became evident that their belief is that weak ties are more likely to bring new knowledge with less danger of redundancy and, furthermore, the flow of information from those with whom the tie is weaker can be greater. Therefore, the discovery of new practices can be enhanced as a result of access to actors from different cultures, with different ways of thinking, feeling and behaving and this diversity can freshen up the process of knowledge creation. Support for this notion comes from the research by Perry-Smith’s (2005), who identified a positive link between the number of weak ties in scientists’ networks and the scientists’ capacity to create knowledge, an essential element of developing practice.

I noted that based on the interviews of those with a positive view of virtual working the use of technology - a given when working virtually - can have a positive effect on development of new practices by stimulating collaborative activity and generating a sense of commitment to the aims of the project. On the other hand, the discussions with participants in Case A with low degrees of virtuality led me to the conclusion that they considered *practice* evolves more effectively in co-located communities and those with low dependence on ICT. This extends the findings in the study of Dube et al, 2006, in which it was identified that virtual communities of practice cannot be considered as “*one-dimensional constructs, with undistinguishing features and undifferentiated identities.*” This supports the notion that the individual characteristics of the community create differential effects.

Where the degrees of virtuality are low, the interviews indicate that it is easier for actors to observe and contribute to the development of the *practice*, as it is easier to give and receive feedback, a crucial component of learning and the creation of new knowledge. Related to this is the question of improvisation, another key factor in knowledge generation, and which is likely to be limited when co-location is reduced.

The following quote from a Senior Consultant in Case A provides an example of this.

“The absence of the opportunities for chance meetings means that spontaneity can be reduced and this can impact on creativity.”

The findings from the group perceiving more challenges with virtual working demonstrate that as the degrees of virtual working increase, it is more problematic to develop new knowledge and contribute to the development of the *practice* of the community as actors become more remote from each other. This is reflected in the study undertaken by Chamakiotis, Dekoninck and Panteli (2013) examining students collaborating on design projects at four major European universities. Their analysis indicates that geographical dispersion exacerbates a sense of isolation, which tends to have a negative impact on the creativity, which is an essential element of the development of common practice.

The two conflicting perspectives are clear. On the one hand, the effects of higher degrees of virtuality on the notion of *practice* indicate that the *practice* is boosted by the ability to reach a wider group of people with diverse skills, which can freshen up the process of knowledge creation. Moreover, there are significant benefits that arise from the increase in the size and scale of the community plus advantages from higher levels of diversity in skill sets heterogeneity of knowledge, as well as language, shared values and culture.

It is evident that not being constrained to interacting and sharing knowledge with those with whom actors have strong ties is major advantage. On the other hand, the findings from chapter four also demonstrate that high degrees of virtuality can result in those actors that are most distributed geographically being excluded from contributing to the resolution of more complex problems as this often requires higher levels of tacit knowledge. The use of technology to mediate interactions is synonymous with distributed geographical locations and the effect of this is that actors are not able to engage in the informal, everyday spontaneous encounters, which often trigger the creation of new knowledge.

This means that practice can be inhibited by higher virtuality with less opportunity to share tacit knowledge through social interaction and observation of the practices of other members. As a result, higher degrees of virtual working can impede collective and group learning and the development of shared repertoire, mutual engagement and joint enterprise.

Whilst virtual working can enhance the development of practice through generating improvements in the ways of working amongst practitioners, when the problem being considered is more complex there is a constraint on the capacity of the virtual community to find solutions which manifests itself in actors reverting to interacting with those closest to them both culturally and geographically.

This phenomenon, underlines the limitations of virtual communities in globalised organisations as is demonstrated by this quote from a Senior Consultant in Case A.

“Takes people longer to process information if they have poor use of the English, usually the dominant language. So when solutions need to be found under pressure we stick to communicating with people we can understand and who understand us.”

7.2.3. The concept of *community*

The respondents suggested that the concept of *community* is felt to be more important where degrees of virtual working are lower and practitioners have a stronger sense of belonging, common identity and overlapping values. This emphasizes the importance of interconnectedness between individual learning and the social context, and highlights how important social relationships are as a means of knowledge creation and learning (Nahapiet and Ghoshal, 1998). The *community* is made up of members, who engage in collective activities, support each other and share information. This acts as a fertile breeding ground for problem solving, creativity and knowledge creation. The nutrients of this fertility are the social relationships that are formed, the rapport, trust and reciprocity established and this, in turn, enables actors to learn from each other. These factors mean that communities of practice contribute to learning by enhancing innovation in organisations through encouraging the creation and sharing of knowledge both at an organisational and group level. Moreover, they contribute to the diffusion of tacit knowledge by using common language, stories and jargon and sharing a set of values and identity, (Bettiol and Sedita, 2011).

The complexities and ambiguities referred to previously are once again apparent. Participants in the group perceiving opportunities have identified that as virtual working becomes more prevalent there are significant benefits associated with an increase in the size and scale of the community and that strong social relationships are diluted as proximity diminishes. Moreover, there are advantages flowing from the higher levels of diversity in skill sets and heterogeneity of knowledge, as well as language, shared values and culture, with high virtuality. The effect is to change the nature of the *community* from being tightly close-knit to a more open grouping of networked individuals. As a result the community is less blinkered and inward looking. Many respondents in all three cases and at all levels of seniority felt that not being limited to interacting and sharing knowledge with people with whom they have strong ties is a major benefit of virtual working. The findings indicate that there are benefits in terms of collaboration and conflict resolution when the importance of strong relationships is diminished.

This resonates with Wu et al., (2017) who posit that conflicts based on relationships are more damaging to collaboration, whilst conflicts that result from task related differences can stimulate discussion and lead to greater levels of knowledge creation. Furthermore, many participants pointed out that, with the higher virtuality, a more democratic *community* and egalitarian environment can emerge, which is more conducive to knowledge creation as actors are not fixed in pre-determined, hierarchical and essentially limited, relationships. Thus, a weaker sense of identity reduces the basis for exclusion of ‘others’ and allows a new form of *community* to emerge which coalesces around common objectives rather than personal relationships and, as earlier discussed, is supported by the development of communication protocols around which individuals find common ground. This insight is demonstrated in the following quote from a Senior Learning Consultant in Case B.

“With virtual working you can include a wider group of people so it makes it possible to develop more innovative solutions to problems and improvements in how we operate. It’s important to have diversity of people - so we need to include those with whom we may not have a long-standing relationship. This helps to keep the ideas fresh and new.”

Amin and Roberts (2008) made a similar point when describing how new ways of learning emerge in communities of practice that are *“purposefully organised to unleash creative energy around specific exploratory projects and typically involving coalitions of scientists, product developers, academics, visual and performing artists, advertisers, software developers, consultants, media professionals, or designers”*.

The sense of community is diluted as actors engage in knowledge exchanges with others that are geographically distributed. The central point about virtuality is that as advances in social media mean technology is better able to focus on the cognitive and collaborative aspects of virtual working and better simulate face-to-face encounters, new ways of knowledge creation emerge, which are not based on a strong sense of togetherness. As a result, with higher degrees of virtuality actors find themselves in significantly larger groups with a greater diversity and increased plurality and heterogeneity of knowledge and weaker links, all of which provide more opportunities for knowledge creation and, as argued Chamakiotis et al., 2013, with associated increases in creativity and innovation.

On the other hand, a majority of participants in the group that perceive more challenges commented that virtual working can lead to a sense of alienation and isolation which can make people feel marginalized, and be very difficult for those that are remote from their fellow community members. With lower geographical distribution, strong social bonds are more necessary as actors are in closer proximity and the sharing of a physical space is more significant. The following quote from a Senior Consultant in Case A highlights this view.

“It is difficult to integrate with people who don’t meet and develop a sense of cohesiveness and engagement. This is often because social element is missing. This can be very frustrating, may cause people to feel left out, and isolated. When you break bread you make bonds.”

“The fact that people are in different places makes it difficult to generate the sense of togetherness – especially as social gatherings are limited, so we tend to rely on those we are closest to us when we need to get the job done and time is tight.”

The conversations with participants with lower degrees of virtuality indicated that their perception is that the physical connection is the ‘glue’ to the cohesiveness of a community and this is diminished when social relationships are weaker. Also, the fact that people are in different places makes it difficult to feel like a *community*, especially as social gatherings are limited. Higher degrees of virtuality mean that the physical connection is missing, and as this can be considered to be the glue to the cohesiveness of a *community*, the sense of togetherness is diminished.

As a result this may inhibit confidence in others and trust building can be more difficult. The quote below from a Consultant in Case A demonstrates this view.

“The fact that people are in different places makes it difficult to generate the sense of togetherness – especially as social gatherings are limited.”

Another insight that emerges is that improvisation is a key factor in learning and knowledge generation, and is likely to be limited when social relationships are less strong and virtual working is high.

This is reflected in Brown and Eisenhardt's study, (1995), of how the behaviour of actors impacts on innovative activity in respect of new product development. The quote below from the Director of Client Development in Case A demonstrates this point.

“Many new ways of working spring out of spontaneous water cooler type meetings, which are difficult to simulate with virtual working”

I noted from the discussions the belief that where there is a need to deal with a complex problem under time pressure, people revert to greater collaboration with those in their tight-knit group with less divergence in terms of language and cultural diversity. This confirms Carlile (2002), who states that where the degree of complexity in collaborative activity is low it is easier to establish a common understanding and the transfer of knowledge has an easier pathway. With more complex projects the lack of shared logic, set of values, understandings and interpretations can inhibit the sharing of knowledge. Indeed, the findings indicate that this could lead to sub-groups being established within the community based on the prevailing language and culture.

This is manifested when those not fluent in the each other's language or au fait with each other's culture will go into a 'huddle' and interact in their own, different ways. The findings demonstrate that as the *community* becomes more diverse, the fact that some cultures are less assertive and more passive affects the way in which more complex projects are dealt with as greater care is needed to give actors more time to articulate, especially when they do not share a common language. As the sense of togetherness and *community* spirit is diluted, the capacity for direct observation of the way fellow members behave is reduced and this further limits understanding of each other's set of observable recurrent activities in their own context. This can impact on the way conflict resolution is handled especially as national identity can lead to different worldviews, associated misunderstandings and stereotyping, and the inability to reach consensus.

The following quote from the Head of Leadership Development in Case B provides an insight into this issue.

“I find that I need to suspend beliefs and values of the other culture and be aware of my own cultural bias. Emotional intelligence plays a major part of this and I believe that we all need an increased capacity to be more self-aware and to be open to self- reflection. I believe we all need to process our own self-talk and be aware that sometimes we may reject ideas that don’t fit our own cultural norms.”

This indicates that great care needs to be taken in cross cultural interaction and is reflected in Nonaka and Takeuchi’s (1995) study of Japanese knowledge creating companies which posits that weaker social relationships *which can result from higher degrees of virtual working – (inserted by the author)* may lead to breakdowns in communication and in the interpretation and processing of information.

The spirit of togetherness which is vital for the establishment of a *community* ethos, (Wenger, et al., 2005) is also challenged when members are spread across many locations and this can make knowledge sharing more difficult to achieve and there are less opportunities for informal collaboration and knowledge sharing. The effect of this is accentuated in circumstances where there is fluidity of membership, instability in structure and the existence of temporary project driven groups. The findings indicate that when members join and leave the group in quick succession it is difficult to sustain a sense of belonging, and temporary membership can inhibit ‘esprit de corps’ and lead to low collaboration and knowledge sharing. This observation is demonstrated in the following quote from a new Consultant in Case A.

“Temporary membership can inhibit sense of esprit de corps and can lead to low collaboration and knowledge sharing.”

Isolation and alienation can be exacerbated by differing cultural perceptions as the following quote from a Consultant in this Case A illustrates.

“Different cultures may have different norms around issues associated with trust – example is copyright of products which makes common identity and sense of togetherness more of a challenge”

Virtual working places greater emphasis on distributed communities and this can increase the notion of cultural distance and in turn can lead to a weak sense of *community* and common identity. Differences in national cultures can lead to different ways of thinking, feeling and behaving and inhibit the development of common ways of working which are necessary for the development of the notion of *community*.

The findings in relation to the notion of community have once again demonstrated the complexity and sense of paradox identified in the previous sections. Those participants with a negative perception believe that virtual working can increase cultural distance and lead to a weak sense of community and common identity, which can undermine the fertility of the learning environment. The findings from these participants indicate that they associate closely with Wenger and Traynor (2011) description of *community* as *“the development of a shared identity around a topic that represents a collective intention—however tacit and distributed—to steward a domain of knowledge and to sustain learning about it.”*

On the other hand those with a positive perception hold the view that with increases in the degree of virtuality the nature of the group changes from a close knit community with hierarchical associations to a more horizontal, open network.

This type of grouping is described by Wenger and Traynor (ibid) as *“a set of relationships, personal interactions, and connections among participants, viewed as a set of nodes and links, with its affordances for information flows and helpful linkages.”*

The findings show how, with higher virtual working, the nature of the learning environment changes from one based on close ties, shared values and common worldview to a new type of open and more networked collection of empowered individuals that are geographically distributed, with a high incidence of temporary project work and with a tendency to work together in a transactional way. This has consequences for group learning as knowledge creation becomes more individualistic in nature and less of a collective endeavour.

Moreover, the individual agents are operating as part of much larger groups with more diversity of in terms plurality and heterogeneity of knowledge.

Once again, this raises important issues for firms operating globally with language, time and culture diversity.

7.2.4 Legitimate peripheral participation

As explained earlier in the thesis, legitimate peripheral participation is the informal way of learning by observation and enables new members to move from the periphery to the centre and assume their role as legitimate members of the community. Lave and Wenger (1991) describe legitimate peripheral participation as a two-way bridge between the development of knowledge, skill and identity - the production of persons on the one side, and the production and reproduction of communities of practice on the other. Therefore, Lave and Wenger have rooted the gaining of knowledge in the context of social relationships – in situations of collective endeavour and co-participation. The key factor is that learning occurs in the workplace rather than in the classroom and as such is *“far more a question of socialisation than of formal learning”* (Trowler and Turner 2002:242). I observed that some actors in communities of practice with higher levels of virtuality acknowledge that larger, more diverse groups give new members greater opportunity to develop the skills and knowledge needed to play their full part in the practice of the community. Furthermore, developments in collaborative ICTs aid the process of equipping new members in virtual environments with the knowledge and skills they need to participate more fully in the community, as the following quote from a Project Manager in Case C demonstrates.

“Nowadays we learn on a need to know basis. So we can learn from web sites where experts codify their knowledge and you can access this. You can then ask questions and grow knowledge and then become master and teach other people in turn.”

With virtual working new members have access to wider networks and an inexhaustible source of on-line resources to aid learning and may not require inputs from those with whom they have close relationships to the same degree as might have occurred in the past. However, in the majority of cases, participants believe that the presence of body language and non-verbal cues provides greater richness and depth to the communication process and thereby enhances legitimate peripheral participation.

Where social interaction is hindered, actors have a reduced opportunity to observe others in situ and this leads to misunderstandings due to the failure to share tacit knowledge, which damages the process of developing new members. The quotes below from managers and staff in Case B demonstrate this belief.

Senior Learning Consultant *“With junior members virtual working is very difficult. There is a great need to keep people on track especially when they are younger and help them to learn from mistakes but not allow the mistakes to do harm. So need to keep eye on them and encourage their enthusiasm.”*

Head of client services: *“Virtual working can impact on new hires as it takes longer to build relationships. This is because people tend to be socialised by those around them in a physical sense, so virtual working makes this more difficult due to the tacit knowledge elements which are difficult to convey in a codified way.”*

Developer: *“People need to be more proactive and I found that the appointment of a ‘buddy’ to help me assimilate was very helpful.”*

Many participants in all cases made the point that the use of a buddy system to aid the socialisation of new members helps minimise the sense of isolation associated with limited opportunities to interact with others. Whilst most buddy systems are instigated by the management, participants felt that with lower degrees of virtual working buddy systems can aid the process of informal learning and encourages new recruits to develop their skills through social interaction and observation.

In this sense the interviews reinforce the essence of the theory of situated learning for the purpose of socialisation with the emphasis on the social element of knowledge creation. This is demonstrated by the following quote from a new member in Case A.

Consultant: *“People need to be more proactive and I found that the appointment of a ‘buddy’ to help me assimilate was very helpful.”*

This suggests that proactivity and a sense of empowerment are necessary for junior members in virtual communities to develop their knowledge and skills.

Furthermore, a lack of clarity about what is required represents a barrier to engagement and collaboration and inhibits knowledge sharing.

As the degree of virtuality increases, the need for greater clarity and common understanding is made even more important. This is made more problematic as people tend to be socialised by those around them in a physical sense, so virtual working, with lower degrees of physical proximity, makes this more difficult and underlines the importance of explicit documentation.

The quote below from the Head of Data in Case C makes this clear.

“We need to be more explicit with virtual working as lack of non-verbal cues are magnified by language differences that often come with virtual working. We need to provide extra clarity of what is acceptable and turn unwritten rules into written rules. We also need to be ready and willing provide more clarification when necessary and be more patient with people.”

With a lack of clarity the potential also exists for dispersed actors to pay less attention and also the possibility of more freeriding as identified by Kiesler and Cummings, (2002) who studied the link between close proximity and group interaction. The importance of distance as an element of human interaction, which was the subject of Olson & Olson’s study (2000) examining the challenges of virtuality for work place organisations, is also relevant in this regard. The interviews indicate that reliance on ICT reduces the opportunity for interpreting subtle nuances of body language, especially when giving and receiving feedback, which extends the work done by Kirkman, et al., (2005) on the importance of non-verbal cues.

Once again, the quote below from a Principal Consultant in Case A illustrates this.

“Most of the information we are trying to communicate comes through non-verbal cues so the absence of these can mean that knowledge sharing can be more difficult if you don’t know the other person and they don’t know you very well. This places emphasis on documents that leave new members in no doubt as to what is required.”

Where the degrees of virtuality are higher there is a need for far greater care to build trust and to ensure clarity in the way communications are expressed.

As a result actors receive information in a timely fashion and understand it in a common way. Once again, demonstrating how the emergence of new protocols based on more explicitness is contributing to overcoming some of the challenges for legitimate peripheral participation associated with virtual working. These challenges are evident in the work done by Williams, (2011) highlighting that *“knowledge transfer involves transmission of knowledge from sender to recipient, as well as its integration and application by the recipient”*. These insights are demonstrated in the quotes below from a senior manager and a less senior member in Case A.

Senior Consultant: *“Trust is the most important thing here for new members and without a good relationship it is difficult to generate a sense of trust. It is easier to have stronger relationships if you meet face to face”*

Consultant: *“If people don’t have strong relationships there can be less commitment and less trust from new recruits. Trust enables cooperation, encourages information sharing, and increases openness and mutual acceptance. This means that good relationships with new members are very important.”*

The issue of culture and language diversity, often a feature of higher degrees of virtuality and geographical distribution, can lead to those working more remotely to feel ignored. The quote below from the CEO in Case C is an example of this issue.

“Virtual working can mean ‘out of sight, out of mind’ so we need to establish a pattern and rhythm of staying in touch.”

This could result in development of ‘in’ and ‘out’ groups as some actors are more remote from the others and this could prevent effective socialisation of new members as some could feel unsupported and ignored and a sense of isolation and alienation, especially when working outside of normal hours and the work-life balance is disturbed.

The interviews identified the complex effect of virtual working on the process of legitimate peripheral participation and how the master/apprentice model, which is a significant feature of the conventional community of practice theory, is modified by higher degrees of virtuality.

Summary

Chapters six and seven have presented the empirical findings from the semi-structured interviews which examined the implications of virtual working for the importance of social relationships in the process of learning and creation of knowledge and the key associated concepts of *practice*, *community* and *legitimate peripheral participation* all of which are central to Lave and Wenger's (1991) work.

The following chapter builds on the empirical findings from the previous two chapters and presents a detailed discussion of the insights that arise from the findings as well as links to the literature and sets out the contributions made by the thesis.

Chapter 8 Discussion

8.1 Introduction

Chapters six and seven presented the empirical findings and an analysis of the participants' responses. Chapter eight presents a discussion of the insights that arise from the empirical findings and sets out the thesis' contributions.

The findings identified new insights uncovered by the study in respect to knowledge creation in virtual communities of practice and the implications of the degrees of virtual working for the importance of strong social ties, the notion of *practice*, the concept of *community* and the process of socialising new members, known as legitimate peripheral participation. The insights from the empirical findings are synthesised below. To ensure clarity the research questions are reiterated as follows:

Primary question

RQ1. What are the implications of virtual working for the existence of a learning environment conducive to knowledge creation in communities of practice?

RQ2. What are the implications of virtual working for the importance of strong social relationships with regard to learning and knowledge creation in communities of practice?

Sub Questions

How does virtual working influence:

- *The notion of practice?*
- *The sense of community?*
- *Legitimate peripheral participation?*

8.2 Synthesis of findings

Table 8.2 below summarises the key findings and discussion points from each of the research questions.

Table 8.2 Key findings and discussion points. Developed by the author		
Research Question	Key findings	Synopsis of discussion points
1. How does virtual working affect the environment in CoPs?	<p>Two issues reflect ambiguity.</p> <p>1. Actors operating at higher levels of virtuality take a positive view and perceive significant opportunities</p> <p>2. Actors operating at lower levels of virtuality tend to perceive more challenges associated with virtual working.</p>	<p>1. Positives.</p> <p>Higher degrees of virtual working in organisations change the dynamics of a community of practice with transition from a co-located close-knit group to a new type of open and networked collection of empowered individuals.</p> <p>2. Negatives.</p> <p>Reinforcement of existing hierarchical power relations through the use of ICT as means of monitoring, surveillance and control. Emphasis on converting tacit knowledge to codified in order to minimise effects of absence of body language and other non-verbal aids to interaction.</p>
2. How does virtual working affect the importance of social relationships in CoPs?	<p>Two issues reflect ambiguity.</p> <p>1. Actors operating at higher levels of virtuality perceive that the weakening of social relationships is not problematic</p> <p>2. Actors operating at lower levels of virtuality tend to perceive more challenges associated with the weakening of social relationships</p>	<p>1. Positives.</p> <p>Higher degrees of virtual working in organisations change the dynamics of a community of practice with transition from a co-located close-knit group to a new type of open and networked collection of empowered individuals.</p> <p>2. Negatives.</p> <p>Higher degree of virtual working undermines strong social relationships that are an important element for communities of practice and are easier to build when the degree of virtuality is lower.</p>

<p>3. How does virtual working affect the notion of practice in CoPs?</p>	<p>Two issues reflect ambiguity.</p> <p>1. Actors operating at higher levels of virtuality perceive opportunities for the development of practice</p> <p>2. Actors operating at lower levels of virtuality tend to perceive more challenges for the development of practice</p>	<p>1. Positives.</p> <p>Practice enhanced by the ability to reach a wider group of people with diverse skills, which can improve <i>practice</i> and freshen up the process of knowledge creation.</p> <p>2. Negatives.</p> <p><i>Practice</i> can be inhibited by higher virtuality, less opportunity to share tacit knowledge through social interaction and observation of the practices of other members.</p>
<p>4. How does virtual working affect the concept of community in CoPs?</p>	<p>Two issues reflect ambiguity.</p> <p>1. Actors operating at higher levels of virtuality perceive significant opportunities associated with a looser grouping</p> <p>2. Actors operating at lower levels of virtuality tend to perceive more challenges for the cohesiveness of the group</p>	<p>1. Positives.</p> <p>As proximity diminishes there are significant benefits. Increase in the size and scale of the community plus advantages from higher levels of diversity in skill sets heterogeneity of knowledge, as well as language, shared values and culture, not being limited to interacting and sharing knowledge with people with whom they have strong ties is major advantage.</p> <p>2. Negatives.</p> <p>Virtual working places greater emphasis on distributed communities and can increase culture distance and lead to a weak sense of community and common identity.</p>
<p>5. How does virtual working affect legitimate peripheral participation in CoPs?</p>	<p>Two issues reflect ambiguity.</p> <p>1. Actors operating at higher levels of virtuality perceive significant opportunities associated with being able to learn from a range of diverse sources</p> <p>2. Actors operating at lower levels of virtuality tend to perceive more challenges for the development of skills necessary to play a full part in the community</p>	<p>1. Positives.</p> <p>Some felt that larger more diverse groups give new members greater opportunity to acquire the knowledge and that on-line resources provide an inexhaustible supply of means to gain new skills and knowledge without needing to have a strong relationships with a 'master'</p> <p>2. Negatives.</p> <p>Presence of body language provides greater richness to the communication process and where social interaction is hindered, actors have a reduced opportunity to observe others in situ and this leads to misunderstandings due the failure to share tacit knowledge and damages the process of developing new members.</p>

The empirical study has uncovered ambiguity in the perceptions of the participants in the study. Some commented on the opportunities of virtual working and others focussed more on the challenges associated with higher degrees of virtuality. These findings can be categorised in two main groupings as follows:

- Actors operating at higher levels of virtuality take a positive view and perceive significant opportunities
- Actors operating at lower levels of virtuality tend to perceive more challenges associated with virtual working.

These apparently conflicting and contradictory perspectives can be explained by recognising that higher degrees of virtual working in organisations change the dynamics of a community of practice. The forces at work in the community are transformed as the community moves further along the continuum of virtuality from a co-located close-knit group to a new type of open and more networked collection of empowered individuals. These groupings are more geographically distributed, with a higher incidence of temporary project work and with a tendency to work together in a transactional way. As the degree of virtuality increases, actors have access to groups with far more members and a greater diversity of in terms plurality and heterogeneity of knowledge. The physical, temporal, and psychological separation associated with virtuality means that actors are less rooted in their immediate context and less connected to each other. This facilitates the development of more diverse and broad networked based communities of practice, which provide opportunities for new, more open ways of learning to develop. In these circumstances actors are increasingly deploying richer communication media, such as teleconferencing or web-based videoconferences, as a means of simulating face to face encounters and reducing some of the drawbacks of virtuality in relation to the absence of body language and other non-verbal aids to interaction. In addition more attention is taken over the process of communication to minimise misunderstandings. These evolving ways of learning are contributing to an enrichment of the environment in communities with higher degrees of virtuality and driven more by an interest in getting the job done, rather than through engaging in pre-existing social relationships within close-knit groups.

Moreover, they are developed through individual agency that can go beyond the structures of the organisations within which they work.

The effects of higher degrees of virtuality on the notion of *practice* indicate that the *practice* is boosted by the ability to reach a wider group of people with diverse skills, which can freshen up the process of knowledge creation. Moreover, when considering the effect on the concept of *community*, as proximity diminishes there are significant benefits that arise from the increase in the size and scale of the community plus advantages from higher levels of diversity in skill sets heterogeneity of knowledge, as well as language, shared values and culture. It is evident that not being constrained to interacting and sharing knowledge with those with whom actors have strong ties is major advantage.

The conflicting perspective can be identified in the findings demonstrating that as well as creating more opportunities for learning at an individual level, virtual working can impede collective and group learning. This can be the result of a number of factors, such as that absorptive capacity may be undermined, as actors are increasingly members of temporary groups and fluidity of membership, making knowledge management more problematic. Furthermore, the reinforcement of the existing hierarchical power relations in firms through the use of ICT as a means of monitoring, surveillance and control coupled with the thrust to convert tacit knowledge to codified forms in order to minimise effects of the absence of body language and other non-verbal aids to interaction is resented and opposed by those with a more negative perspective. As we have seen the community of practice concept is founded on a constructivist approach, which incorporates agency, and attempts to resist surveillance and codification are examples of the exercise of this as associated with the drive towards codification is the fear of de-skilling and associated with loss of labour power. Moreover, social media tools can be a double-edged weapon as actors tend to engage in subversive attempts to use personal and direct methods of communication as a means of avoiding management surveillance and, by so doing, seek to change the power dynamics in the workplace between the organisation and its knowledge workers. Another challenge is that high degrees of virtuality can result in those actors that are most distributed geographically to be excluded from contributing to the resolution of more complex problems as this often requires higher levels of tacit knowledge to be available.

The use of technology to mediate interactions is synonymous with distributed geographical locations and the effect of this is that actors are not able to engage in the informal, everyday spontaneous encounters, which often trigger the creation of new knowledge. This means that *practice* can be inhibited by higher virtuality with less opportunity to share tacit knowledge through social interaction and observation of the practices of other members. When considering the concept of *community* from the negative perspective it is clear that virtual working places greater emphasis on distributed communities and can increase culture distance and lead to a weak sense of *community* and common identity which can undermine the fertility of the learning environment. Overall, the findings indicate that social relationships are an important element for communities of practice, are easier to build when the degree of virtuality is lower and are weakened when virtuality is increased.

The findings in relation to legitimate peripheral participation also indicate the persistence of ambiguity. Some participants acknowledge that larger more diverse groups give new members greater opportunity to acquire the knowledge needed to play their full part in the practice of the community. Furthermore, these participants confirmed their belief that the developments in collaborative technologies aid the process of socialising new members in virtual environments and new members benefit from knowledge exchanges with geographically dispersed members. Virtual working gives new members access to wider networks and an inexhaustible source of on-line resources to aid learning and may not require inputs from those with whom they have close relationships.

However, the findings clearly indicate that where social interaction is hindered, actors have a reduced opportunity to observe others in situ and this can lead to misunderstandings due to the failure to share tacit knowledge and damages the process of developing new members. Moreover, the presence of body language and non-verbal cues provides greater richness and depth to the communication process and enhances legitimate peripheral participation.

These insights are explored in more detail below.

8.3 Spectrum of virtuality

The findings have shown that communities of practice engaged in virtual working will be on a spectrum along which different degrees of virtuality apply depending not just of the reliance on technology but also on the presence of the other elements of virtuality represented by geographical distribution, language and cultural diversity, time differences and frequently changing membership.

8.3.1 Higher degrees of virtuality

With higher degrees of virtuality, a significant number of participants felt that virtual working is enabling access to wider and more diverse groups and this is perceived as having positive consequences for learning and knowledge creation. This perception is strengthened as the use of technology transitions from being a means of storing, accessing and sharing information, to one of facilitating collaboration. Actors are engaging with each other across space and time made possible by advances in technology that allow communities of practice to increasingly interact in a virtual and distributed way with less need for co-location. New ways of sharing knowledge and understanding in the electronic space are emerging as virtual working enables access to pockets of information that are geographically, socially and culturally distant which can stimulate the process of generating knowledge. Moreover, with higher levels of virtuality, actors tend to find themselves in significantly larger groups with a greater diversity of in terms of fellow members and increased plurality and heterogeneity of knowledge. This can lead to more opportunities for creativity and innovation. Higher degrees of virtual working in organisations change the nature of a community of practice from a co-located group with physical proximity and a sense of close-knit cohesiveness that builds over time, to a new type of open and more networked collection of individuals who are geographically distributed and interact in a transactional way with a high incidence of temporary project work.

As a result virtual working is changing the way in which the theory of situated learning and the concept of a community of practice can be applied by opening up new pathways for learning to take place. Higher degrees of virtual working lead to physical, temporal, and psychological separation amongst members and actors are less embedded in immediate contexts and are less connected to each other.

This facilitates the emergence of more diverse and broad networked based communities of practice, which provide opportunities for new, more open ways of learning to develop.

These communities complement their interactions with richer communication media, such as teleconferencing or web-based videoconferences, in an effort to reduce some of the drawbacks of virtuality in relation to the absence of body language and other non-verbal cues that aid communication in face to face environments. The new forms of learning do not rely on close knit groups and are built on notions of knowledge construction emphasising individual agency that can transcend the structures imposed by the immediate boundaries of the organisations within which they work. Work schedules are also re-structured in a different way, with greater care around how work is organised. This heightened sense of the need for greater care can also be seen in the recognition of the need to be more explicit in both spoken and written forms of communication and this contributes to make virtual working less problematic and creates a more level playing field.

8.3.2 Lower degrees of virtuality

On the other hand, there is a significant group of participants who take a more negative view of the implications of virtual working. Participants in communities operating at lower levels of virtuality, where face-to-face meetings are still a regular feature of how the community operates, felt that virtual working undermines fertility of the environment for the co-construction of knowledge. These participants felt that close-knit groups with common identity are difficult to form when degrees of virtual working are high and were especially concerned with how technology can be used for the purposes of surveillance, underlining the issue of the balance of power within organisations. Feelings of resentment were apparent, particularly amongst those not holding managerial positions. These resentments can undermine the culture of trust necessary for knowledge sharing and knowledge creation. The issue of power can also be identified in the thrust to make knowledge more explicit in order to make it easier to transfer to others.

This feeds in to concerns relating to how the power of workers may be undermined by technological developments that can lead to a dilution of their power, skills, status, job-satisfaction and well being as well as a reduction in income.

The findings from this category of participants also indicate that, whilst virtual working can enhance individual opportunities, it can also inhibit collective and group learning by the creation of tensions that weaken the environment for knowledge generation and that absorptive capacity and organisational memory may be weakened, as actors are increasingly members of temporary groups with “no history and no future”.

The findings presented indicate that increased virtual working changes the composition of the building blocks, which contribute the fertility of the environment for knowledge creation. The degree of ambiguity in the findings reflects the complexity of how learning and knowledge creation occur when impacted by virtuality. The study posits that global organisations need to deal with this complexity by balancing the opportunities of wider but weaker links created by virtual working with the need to minimise the risk of undermining the climate within which learning can flourish. This is particularly the case when work place organisations are genuinely seeking to encourage knowledge creation across multiple sites where language, time zones, and culture vary.

The empirical data has identified significant contrasts and ambiguities in the perceptions of the participants that imply quite high levels of complexity in how to understand the effects of virtual working on communities of practice and on virtual communities of practice. These perceptions can be categorised in two major groupings; actors who tend to hold a positive view of virtual working, embrace its implementation and see the opportunities for learning through the medium of technology, these actors tend to be in Cases B (multi-national corporation) and C (SME with global reach) of the research setting; and actors who tend to perceive more challenges associated with virtual working and resist its adoption, these actors tend to be in Case A (Professional Institution) of the research setting. The ambiguity reflects the complexity of how learning and knowledge creation takes place when impacted by virtuality. What is clear is that virtuality leads to a physical, temporal, and psychological separation between actors conducting similar practices. The results are the emergence of more diverse and broad networked based groupings, which provide opportunities for new, more individualised and open ways of learning to develop. However, actors see virtualisation as a both a benefit and a source of resentment and frustration, which can explain the degree of antipathy, felt by some participants to the use of technology.

Thus, once again, underlining that the characteristics of the community in relation to the degree of virtuality is a crucial explanatory factor as to why there are these differing views.

Situated learning theory is based on the assumption that knowledge is socially constructed in an environment, which encourages the creation and sharing of knowledge and is based on the building blocks of a set of shared values, identity and common worldview and a body of common knowledge/practice. The building blocks imply the existence of strong social relationships, which those mainly in Case A of the research setting believe are the corner stone of the community. These participants are characterised by frequent co-located meetings and a low degree of geographical distribution and diversity of language and culture. To the extent that members of this group are geographically dispersed they tend to be in the same country rather than overseas. The perceptions from this set of participants suggest that strong social relationships are not only an important element for communities of practice, they are also easier to build when the degree of virtuality is lower. This confirms the extant literature, and reinforces situated learning theory. Many interviewees pointed out that as the degree of virtual working increases, strong social ties become more difficult to build and that this can inhibit the development of *practice* and undermine the closeness of the *community*. Participants in Case A indicated that it is easier to understand others if relationships are strong and that this, in turn, aids the process of learning and the co-construction of knowledge. However, as discussed, although there is less empirical evidence, the literature also points out that there can be different types of communities of practice that are built upon broader and heterogeneous ties, similar to those expressed by respondents in cases B and C with a more positive view see the opportunities created by virtual working. These participants are characterised by infrequent co-located meetings and a high degree of geographical distribution and diversity of language and culture and where members of this group are geographically dispersed they are often in another country.

The interviews with this group of participants highlight that as the strength of social relationships becomes diluted when the community moves further along the spectrum of virtuality, new ways of learning emerge and create the possibility of accruing the benefits of weak-links, which contribute to the fertility of the environment for knowledge creation in a completely different way.

Virtual working changes the environment for learning by facilitating the development of relationships that are less based on physical proximity and a sense of shared values, identity and common world view to a set of relationships where interactions are mediated through technology and connections are based on shared, and possibly transitory goals rather than on the enduring strength of interpersonal relationships.

In relation to the process of legitimate peripheral participation, the findings generally indicate that higher degrees of virtuality have a significant impact on how new members are socialised. Lave and Wenger's (1991) concept of a community of practice as a means of generating knowledge is based on new members being able to observe more senior members and then engage in initially basic and then increasingly more complex tasks and in so doing develop skill and mastery and take up a more central and active role and finally participate fully in the community. Since the process starts with observation, the fact that the community is geographically, culturally and temporally dispersed and interaction is mediated through technology makes the Lave and Wenger's (ibid) characterisation of legitimate peripheral participation more problematic. The findings demonstrate that new wave technologies provide the capacity for new members to have access to wider networks and, significantly, to an inexhaustible supply of on-line resources to aid learning. Therefore, they do not need to rely on inputs from those with whom they have close relationships to the same degree as might have occurred in the past, thereby changing the way in which the process of legitimate peripheral participation occurs.

In communities with low virtuality the learning environment is based on the relaxed conventions that facilitate communication and are largely built on tacit and organisationally specific cultural norms. These informal norms contribute to the fertility of the learning environment and contribute to the social construction of knowledge based on strong social ties and common identity.

The interviews demonstrate that virtual working is leading to the development of new protocols around virtual working that appear to have been developed to compensate for some of the disadvantages associated with the dilution of strong social ties and the possible erosion of the fundamental building blocks of a co-located community. These new codes seek to establish a more codified method of operating.

This helps to provide greater clarity and a higher degree of specificity in the use of language to ensure that the range of possible interpretations is narrowed down as much as possible to minimise the risk of misunderstandings and compensate for the absence of the non-verbal cues which aid the process of face to face communication.

These protocols provide a framework for organisations operating across many cultures where language and time zones vary, to embrace the complexities and ambiguities of virtual working and to take advantage of the opportunities that accrue from wider and more diverse groups with the need to minimise the risk of weakening the fundamental building blocks of knowledge creation as the strength of social relationships becomes diluted.

8.4 Limitations of virtual working

Thirdly, a further insight has emerged which points to the limitations of virtual working. The empirical material has demonstrated that when there is a need to deal with a complex problem under time pressure, actors revert to greater collaboration with those with whom they have stronger social relationships and less divergence in terms of language and cultural diversity. As Baer (2010) said, diversity often requires *“substantial integrative work on the part of the individual.”* A pattern is therefore emerging from the interviews indicating that a higher degree of heterogeneity means it is more difficult to integrate knowledge and may inhibit the solving of more complex problems. This is especially challenging when the degree of diversity in the community means that the perspectives and approaches of the various actors are fundamentally different. This underlines the limitations of virtual working and has profound implications for global organisation as it raises uncertainty regarding whether the extent to which a *community* that is diverse can be both an asset and liability based on the nature of that diversity and the complexity of the issue under consideration.

8.5 Thesis contributions

The above discussion has provided foundation on which to set out how the thesis contributes to the debate on virtual communities of practice in the following ways:

8.5.1 Complexity

The study has identified that there are significant complexities that arise in the way in which knowledge is created and shared when virtual working is more prevalent and uncovered ambiguity in the perceptions of the participants in the study.

There are two main groupings identified in the research each with conflicting perspectives. Actors operating at higher levels of virtuality take a positive view and perceive significant opportunities; whilst actors operating at lower levels of virtuality tend to perceive more challenges associated with virtual working. The figures below summarise the key effects for each of the two groupings and offers a more fine-grained understanding of how communities of practice are influenced by virtuality than is provided in previous studies.

Figure 8.5.1a - high degrees of virtual working:

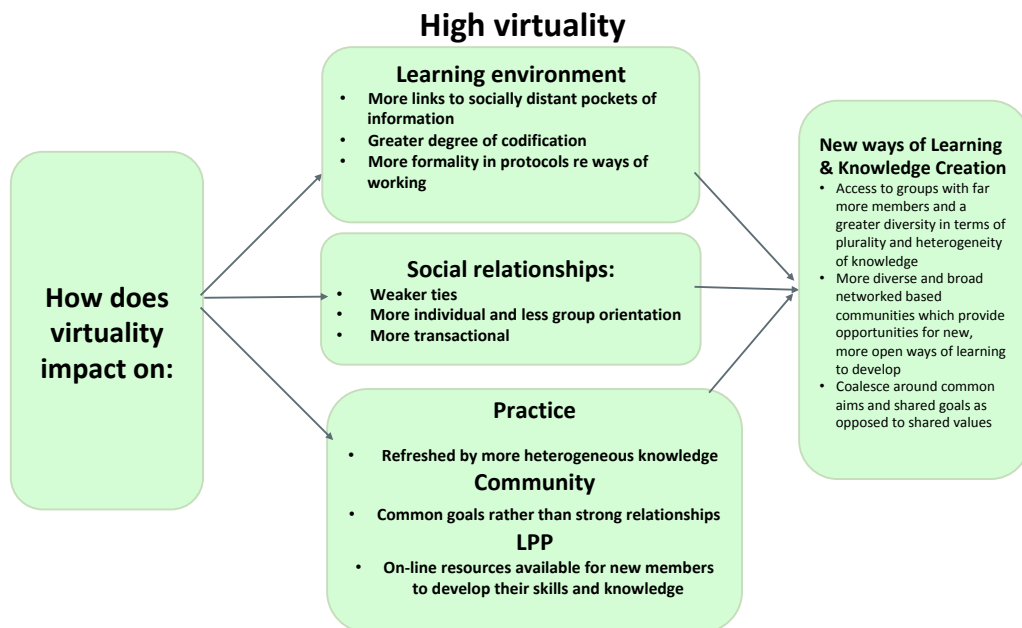
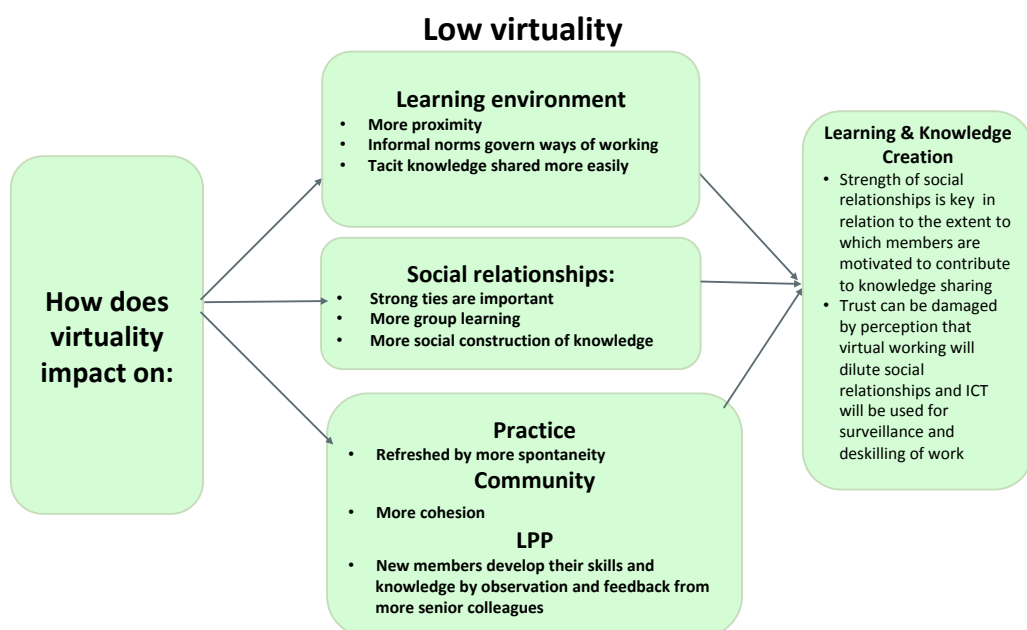


Figure 8.5.1b - low degrees of virtual working:



These apparently perspectives can be understood by recognising that as the community moves further along the continuum of virtuality from a co-located close-knit group to a new type of open and more networked collection of individuals the dynamics of organisational culture, and organisational power relations are changed. New groups emerge that are more geographically distributed, with a higher incidence of temporary project work and with a tendency to work together in a transactional way. As the degree of virtuality increases, actors have access to groups with far more members and a greater diversity in terms of plurality and heterogeneity of knowledge. Moreover, this notion of diversity extends beyond that of knowledge and includes diversity of employment conditions and the “psychological contract” with the organisation, with other employees and indeed with the projects in which the members are engaged.

The physical, temporal, and psychological separation associated with virtuality means that actors are less rooted in their immediate context and less connected to each other. This facilitates the development of more diverse and broad networked based communities of practice, which provide opportunities for new, more open ways of learning to develop. In these circumstances actors are increasingly deploying richer communication media, such as teleconferencing or web-based videoconferences, as a means of simulating face to face encounters and reducing some of the drawbacks of virtuality in relation to the absence of body language and other non-verbal aids to interaction. In addition more attention is taken over the process of communication to minimise misunderstandings.

The conflicting perspective can be identified in the findings and demonstrate that as well as creating more opportunities for learning at an individual level, virtual working can impede collective and group learning. This can result in the undermining of absorptive capacity, as actors are increasingly members of temporary groups and fluidity of membership, making knowledge management more problematic. Furthermore, increased use of technology within an organisational setting can be interpreted as a reinforcement of the existing hierarchical power relations especially the use of ICT as a means of monitoring, surveillance and control coupled with the thrust to convert tacit knowledge to codified forms in order to minimise effects of the absence of body language and other non-verbal aids to interaction. This can be resented and opposed by those with a more negative perspective.

The above findings underline the importance of the community of practice as a concept that is “constructed” and re-constructed by actors.

The complexity is reflected in the finding that organisational changes and new technology has the effect of changing the potential agency of actors as those that are most distributed geographically can be excluded from contributing to the resolution of more complex problems which often requires higher levels of tacit knowledge to be available - and re-assembling networks that are used for various purposes including resist surveillance and codification for fear of de-skilling.

In summary, higher levels of virtuality lead to larger groups with more diversity of in terms plurality and heterogeneity of knowledge. As a result, actors are less rooted in their immediate context and are less connected to each other. This means that the Granovetter’s (1973/83) theory of benefits of weak ties can be applied to the context of knowledge creation within communities of practice. The original theory related to job search and how those with whom one was less well connected can play a significant role in finding a job. As the degree of virtuality increases, relationships are characterised by a lower levels of connectedness on a friend or family level, sporadic contact and short history and this, in turn, facilitates greater access to socially distant pockets of information that can freshen up the process of knowledge creation. The findings demonstrate that increasing virtuality changes the nature of the environment for knowledge creation. Situated learning theory places knowledge creation within the context of the enduring strength of interpersonal relationships, physical proximity, a sense of shared values, identity and common worldview and a focus on group learning. This study argues that higher levels of virtuality lead to more individual interactions mediated through technology and the emergence of more diverse and broad networked based communities consisting of geographically dispersed and empowered actors with weak social relationships and a tendency to work together in a transactional way with connections that are based on shared, and possibly transitory, goals.

In this process legitimate peripheral participation is influenced by higher degrees of virtuality in communities of practice. Two key principles of legitimate peripheral participation put forward in Lave and Wenger work on Situated Learning (1991) are, firstly, that knowledge needs to be contextualised in a setting that would normally encompass the knowledge in question; and secondly, that learning requires both social interaction and a degree of collaboration, usually between experienced and less experienced actors. The evidence identified in this study points to the fact that the master/apprentice model, which is a significant feature of the conventional community of practice theory, is modified. The contribution that has emerged is that more diverse groups and new wave collaborative technologies enable new members to benefit from access to wider networks and an inexhaustible source of on-line resources to aid learning. As a result, the new member may not require the degree of supervision from a 'master' with whom a close relationship is required, thus reflecting the complexity of how learning and knowledge creation takes place when impacted by virtuality. This insight extends the work by Newell (2015), which underlines how the rapid developments in technology, particularly in social software, are creating significant implications for the ways in which new members can be socialised.

8.5.2 Development of new protocols

The study has illustrated that there is an inverse relationship between the degree of virtuality and the prevalence of strong social ties between members. As well as enabling new weak links to be established within communities of practice, higher degrees of virtuality also lead to the dilution of social relationships and this is seen by some as a negative implication that should be resisted. Ardichvili, Page and Wentling (2003) in their study on the motivation and barriers to participation in virtual knowledge-sharing communities of practice in the Caterpillar Company, have shown how the organisational culture can affect the extent to which members were motivated to contribute to knowledge sharing. This thesis argues that new cultures and different ways of working can be encouraged by the development of more formal and explicit protocols. These new cultures help to balance the opportunities of wider, but weaker links created by virtual working, with the need to minimise the risk of undermining the fertility of the climate within which learning can flourish by weakening close social relationships.

These new practices are fundamentally different from the informal codes that facilitate communication in co-located communities, which are largely built on tacit and organisationally specific cultural norms. The new ways of working require a greater degree of codification of information to ensure greater precision and intelligibility in the use of language. This is necessary to minimise the possibilities of misunderstandings and balance the absence of facial expressions and gestures, which aid the process of person-to-person communication.

8.5.3 Classification of communities of practice

As the study has identified, the impact of virtual working on communities of practice has complex effects including the blurring of boundaries of communities as demonstrated by Zablith et al. (2016) exploration of why people share knowledge in online communities. Verburg and Andriessen (2011) in an attempt to address this complexity suggested a new classification of communities based on the degree of geographical dispersion on the one hand and the degree of formality on the other. Amin and Roberts (2008) also argue that it is crucial to differentiate between forms of communities, as they will vary in terms of their features and dynamics. As a result, Amin and Roberts (2008) presented a new typology of communities of practice, which extended the concept beyond the task/craft-based communities referred to in the initial studies by Lave and Wenger (ibid) and Brown & Duguid (ibid) where knowledge creation and transfer is dependent to a large extent on co-location as much of the knowledge is tacit.

Amin and Roberts, (ibid) added three other classifications to their typology:

- Professional associations that promote the dissemination of new knowledge
- Epistemic/creative communities described as *“purposefully organised to unleash creative energy around specific exploratory projects and typically involving coalitions of scientists, product developers, academics, visual and performing artists, advertisers, software developers, consultants, media professionals, or designers”*
- Virtual communities whose members use ICT to facilitate the exchange of knowledge

Whereas Amin & Roberts' (ibid) categorisation introduces *virtual* as a separate category from the other three, this study suggests virtuality can influence all categories through differential effects on the means through which knowledge is created and shared.

Whilst the thesis has identified three separate stages on virtuality, the movement from one stage to another can also be seen as a continuum through which the community of practice moves in relation to the extent to which ICT is deployed to mediate interactions. This demonstrates that fundamentally all communities of practice can find themselves pressured to operate virtually, and to an increasing extent. Moreover, the study has identified that there may well find different levels of difficulty flowing from resistance based on fear of surveillance and de-skilling of work as well as the requirement for tacit knowledge to be available to solve more complex problems. Moreover, at the highest levels of virtuality the notion of *community* is stretched to its limit and the concept of a *community of practice* may be more usefully referred to as a *network of practice*, thus reflecting the *Gemeinschaft-Gesellschaft* dichotomy identified by Tönnies (1912) in which a community (*Gemeinschaft*) is characterised by social ties based on personal social interactions and a sense of togetherness and implicit ways of self-regulation. With increasing virtuality the community moves more towards Tönnies notion of *Gesellschaft*, a grouping or network of individuals characterised by instrumental relationships governed by more explicit and codified norms.

8.6 Summary

This chapter has presented a discussion of the findings of the empirical research from the three cases in the research setting. The analysis was based on the literature review, which highlighted how, despite the fact that there are many studies that examine how a community-based approach contributes to learning, there is a lack of literature that specifically uses the lens of virtual working to examine the changing nature of social relationships on knowledge creation and knowledge sharing within communities of practice. This chapter has presented the contributions of the study together with some of the key influences of virtual working on social relationships within and between communities of practice. The following and final chapter summarises the study and concludes with a discussion of the limitations of the research and suggestions for further study.

Chapter 9 Conclusion

9.1 Introduction

Chapter eight presented a discussion of the insights that arise from the empirical data and the contributions of the thesis. Chapter nine sets out the conclusion of the thesis, together with implications for organisations as well as outlining the limitations of the research with some suggestions for further study.

Daniel Kahneman, Economics Noble Laureate, interviewed in 2007 about his landmark work on Behavioural Economics, *Thinking Fast & Slow*, explained that, in his view, the process of research is very much like a good conversation. He says:

*"No one single person dominates, but what does happen is when you **interject** something, when you contribute something to a **conversation**, you want to be understood, you want to be heard, you would like people to pay **attention**, you would like it to have some influence on the way the conversation goes. You don't control it."*

This aim of this study has been to contribute to the '**conversation**' in the following ways. Firstly, to '**interject**' by providing some insights into the implications of virtual working for the concept of a community of practice. Furthermore, to gain '**attention**' by identifying why organisations can do to cultivate and foster an environment for virtual communities of practice within which knowledge creation and knowledge sharing can be sustained and increased. Moreover, to gain further '**attention**' by providing a detailed empirical account of how actors addressed key challenges for knowledge creation in virtual communities of practice. This is of relevance to practioners and other stakeholders with an interest in the effectiveness of knowledge creation and knowledge sharing in a globalised economic environment within which virtual working is increasingly prevalent.

9.2 Overview of study

The theory of situated learning first introduced by Lave and Wenger in 1991 has proved to be a powerful way of thinking about the way in which knowledge is created and shared. The community of practice is one of the theory's core concepts and despite its widespread propagation over the past two decades there are questions about its applicability in a globalised virtual environment. The thesis demonstrates the interplay between the various elements of virtual working and the research themes, which are Lave and Wenger's (1991) key foundations of communities of practice; the importance of the strengths of social ties, the notion of *practice*, the concept of *community* and the socialisation of new members, legitimate peripheral participation. A new classification of communities of practice is put forward, that reflects the fact that as dependence on Information technology increases the effects on the themes examined in the research change. This new classification also takes into account that with increasing dependence on Information technology are associated increases in the incidence and influence of the other elements of virtuality; distributed location, national differences, cultural differences, language differences, time differences and fluidity of structure. This study contributes a more fine-grained appreciation of how virtual working influences knowledge creation in a community of practice than is provided in much of the existing literature, which tends to focus on the effects of **either using technology or not** using technology to mediate interactions rather than considering all the elements of virtuality each of which can have a differential impact. Moreover, it extends the findings in the extant literature by contributing to the development of the Lave and Wenger's (ibid) theory of situated learning and their concept of a community of practice. In particular, it contributes to the scholarly conversation by examining the effects of the varying elements of virtuality on each of the research themes.

Chapter one set out the main concepts and the clarified how digital technology is facilitating new forms of creating knowledge within and between organisations such multi-national firms, professional institutions, governmental and non-governmental bodies. People are increasingly working in a distributed way and using technology to mediate their interactions. As a result communities of practice are forming across space and time.

Chapter one also explained that study investigates communities of practice across virtual spaces in multi-national organisations and that the focus will be on the issue of knowledge creation within the context of virtual communities of practice. Chapter one pointed out that despite the prevalence of virtual communities of practice in most industries, there are relatively few studies examining how situated learning theory plays out in the context of virtual working. This means that there is a need to undertake research into how these new wave developments in technology impact on learning as a function of social relationships. The thesis examines the issue of whether social interactions mediated through technology are capable of providing a sufficient platform to develop mutual engagement, sense of joint enterprise, and a shared repertoire of communal resources necessary for knowledge creation in virtual communities of practice.

Chapters two of the thesis set out the theoretical concepts and reviewed the streams of literature relating to:

- Situated learning theory and the associated concept of the community of practice
- Social ties

Chapter three reviewed the streams of literature relating to virtual working.

The literature review chapters highlighted how, despite the fact that there are many studies that examine how a community-based approach contributes to learning, there is a lack of literature that specifically uses the lens of virtual working to examine the changing nature of social relationships on knowledge creation and knowledge sharing within communities of practice. This research thesis seeks to address this gap. The aim of the study is to analyse the influence of virtual working on social relationships within and between organisation-based communities of practice, and the implications for the theory of situated learning, thus providing the need for this study.

The reviews identified that a community of practice is a social locus for learning in practice, (Lave and Wenger, 1991; Brown and Duguid, 1991; Wenger, 1998).

Lave and Wenger's (1991) concept of a community of practice places much emphasis on the need for strong social relationships in the creation of knowledge. Nevertheless, the fact that digital technology is facilitating new forms of creating knowledge within and between organisations means that actors are increasingly working in a distributed way and using technology to mediate their interactions with less need for co-location. This provides the foundation for the study of how the implications of virtual working for the theory of situated learning.

Chapter four set out the research design and the data collection and analysis approaches. The chapter explained that the thesis deploys a qualitative research strategy which is the most appropriate as the aim of the research is to understand the phenomena being studied from the perspective of the participants, (Myers, 2000, p1). Furthermore, the approach has been an inductive one as the study *"involves the search for a pattern from observation and the development of explanations for those patterns"*, (Bernard, H.R. 2011). The design is explanatory in nature and seeks to bring more clarity to the issues being studied, particularly as these have not been fully researched hitherto. The chapter presented a detailed 'road map' of the research design. Building on previous studies, the research examines four key interrelated factors that influence knowledge creation in virtual communities of practice. These are the fertility of the environment and its conduciveness for learning, the importance of the strength of social relationships, the effect of virtual working on the notion of *practice*, the concept of *community* and the process of *legitimate peripheral participation*. Chapter four set out the justification for the case study approach and the methods of data collection and data analysis together with the means of establishing the validity of the data. Background information about the organisations from which the cases are chosen was also provided - a multi-national corporation in the telecommunication industry and a professional institution with over 110,000 members in more than 140 countries.

Chapter five presented an overview of each of the three cases together with an explanation of the nature of the communities of practice and the type of technologies used together with examples of virtual working in which the members engaged.

The communities examined within this study have different degrees of virtuality ranging from regular face-to-face meetings to a greater reliance on ICT. In all three cases the main purpose during their interactions is to find creative and innovative solutions to problems that occur in their day-to-day work.

Chapter six and seven set out the empirical findings and provided relevant quotations from participants, together with an interpretation of the participants' responses and the insights that arise from them as well as links to the literature as appropriate.

Chapter eight, provides a discussion of the insights the study has uncovered and a synthesis of the empirical findings in order to provide answers to the research questions and to address the gaps in the literature in respect to the impact of virtual working on communities of practice. In addition, this chapter summarises the contributions of the thesis.

The final chapter nine concludes the thesis and presents an overview of the whole study together with the implications of virtual working for situated learning theory and organisational learning and for empirical for practioners and other stakeholders with an interest in the knowledge creation and knowledge sharing in a globalised economic environment within which virtual working is increasingly prevalent. This chapter concludes with the discussions of the limitations of the research and proposes new research questions as suggestions for further study.

9.3 Implications for our understanding of communities of practice

This study has found that where there is a need to deal with a complex problem under time pressure there is a tendency for actors to limit interactions with their weaker ties and revert to collaborating more closely with actors with whom there are stronger social relationships and less divergence in terms of geography, language and cultural diversity. This finding is significant as it shows that it is more difficult to integrate knowledge with a higher degree of virtual working and that more diversity and heterogeneity may actually inhibit the solving of more complex problems. This has profound implications for global organisations as it raises uncertainty regarding whether the extent to which a *community* is diverse can be both an asset and liability based on the nature of that diversity and the complexity of the issue under consideration.

The interviews indicated a perception that technology can be used as a means of surveillance and as means of driving the codification of tacit knowledge in order to overcome the absence of face-to face contact. The thesis has also uncovered that when actors feel compelled to use a particular technology platform they may well lose confidence in the motives of the organisation and turn to the use of “*subversive*” technological tools to facilitate their interactions. This perception may be accentuated by the fear of de-skilling, which can be linked to labour process theory, (Braverman 1974). There are also resonances with Giddens’s (1979) theory of how social structures interact with individual agency, highlighting how actors’ behaviour can be shaped by the structure and vice-versa. The new protocols referred to above have led to a change in the ways of working, which has led to differing responses by the actors based on their perceptions of the effect of virtual working. Some actors fear that work will transition from being a creative and satisfying endeavour that enables workers to be autonomous in terms of knowledge creation, into a set of mindless activities that leave workers with little or no power with which to influence the organisation and assert their rights in the workplace. It also means that there is often ‘no history’ and ‘no future’ in terms of the relationships between their fellow members in increasingly temporary groupings, (Panteli, 2004) and this heightens the sense of resentment, isolation and alienation that some more remote actors feel. Increasing developments in Artificial Intelligence and Machine Learning reinforce these perceptions.

Further empirical work undertaken in December 2018 with a sample of participants to review the findings from the initial interviews indicates that the issues of Artificial Intelligence and Machine Learning are progressively featuring as a source of interest and apprehension. Observations derived from these additional discussions demonstrate that those whose work is of a more routine nature feel this concern most strongly.

9.4 Implications of the study for organisations

This thesis has addressed the need to investigate communities of practice across virtual spaces in organisations operating on a global basis and has provided a deeper understanding of the issue of knowledge creation within these communities. The study has confirmed that whilst technology has made it possible for communities to interact remotely, truly effective knowledge creation and knowledge sharing is not just about access to the most advanced technology, but also about the ability to construct shared dialogues, identities, stories and jargons that underpin new practices and at the same time work around cultural and language differences. Despite the prevalence of virtual communities of practice in most organisations, there are relatively few studies examining how knowledge creation plays out in the context of the changing social dynamics that flow from virtual working. This study has addressed the gap and has highlighted some of the challenges and opportunities that arise when social interactions are mediated through technology in a globalised virtual environment.

Organisations and practioners seeking to cultivate virtual communities of practice can now be more aware of the implications of virtual working, that may not have been previously apparent. The study has emphasised the criticality of the striking of the right balance in organisations that are genuinely seeking to encourage knowledge creation across multiple sites where language, time zones, and cultures vary. Organisations are making increasingly significant investment in technology in the workplace and this is having positive effects in terms of productivity. However, at the same time they need to be aware of the fact that for some actors there exists a sense of regret and resistance at the diminution of the importance of social relationships and the reduction in their perceived relevance and self-efficacy as a result of virtual working.

9.4.1 Suggestions for organisations with virtual communities of practice

Organisations seeking to cultivate virtual communities of practice need to be aware of the following implications of virtual working which are clustered in relation to the research themes:

9.4.1.1 Strength of Social Ties

Virtual working reduces the significance of strong social ties as a requirement for learning within communities of practice and at the same time enables new weak links to be established within communities of practice, which can be beneficial. Associated with this is the existence of an inverse relationship between the degree of virtuality and the prevalence of strong social ties between members. Higher degrees of virtual working lead to a lower incidence of strong social ties and people seek to make their on-line presence more significant. This can result in people seeking to increase their number of *'friends'* or *'followers'* as a means of compensating for the absence of meaningful relationships based on physical proximity closeness and frequent physical encounters. Relationships are formed more on the basis of reputation. The diminishing importance of strong social ties as the degrees of virtuality increase inhibits members' ability to share tacit knowledge through social interaction with, and observation of other members of the community.

Moreover, language differences can inhibit communication and make it difficult for people to work to form strong ties and create and share knowledge, particularly where the degree of complexity in relation to the knowledge is high. When there is a need to deal with a complex problem under time pressure, people revert to greater collaboration with those in their tight-knit group. The extent to which the barrier can be overcome is dependant on the level of language skills of the actors involved. The issue of cultural diversity and the associated challenges represented by language barriers is a growing one for virtual communities of practice. These encompass the process of communication as well as the cultural factors that can impact on the quality of the communication and the effect that this has on the quality of relationships.

9.4.1.2 Practice

Different national cultures lead to different ways of thinking feeling and behaving, (Earley and Gibson, 2002) which could inhibit the development of common ways of working which are necessary for the development of practice in which members are mutually engaged, (Wenger, 1998). Conflict resolution could also be problematic as national identity can lead to different world views and associated misunderstandings and stereotyping and the inability to reach consensus (Adler, 1997).

It is critical that members have awareness of the culture of their fellow members In terms of the traditions, attitudes, beliefs and behaviours so as to be able to interact in an acceptable and culturally sensitive manner. When members are spread across many locations knowledge sharing may be more difficult to achieve and there are less opportunities for informal collaboration and knowledge sharing. This could also impact on the way in which tacit knowledge shared.

In virtual meetings language becomes the dominant factor. As different people can interpret language in different ways people may draw different conclusions on the basis of what has been heard. These conclusions lead from tentative interpretations to fixed understanding and this can lead to a polarisation of interpretation and the potential that others may well reject decisions taken by some members. Rhetorical skills such as humour, symbolism, sensitivity and appropriate norms governing negotiating and effective influencing are cultural dependent and will only work effectively when deployed appropriately in the right cultural context. The international 'strength' of the language being used for the meetings will mean that those who are working in their preferred language will exercise the power in the relationship. This can lead to and a sense of mistrust and dislike between the parties – with associated effects on the quality of the relationships.

9.4.1.3 Community

The notion of community could be challenged by cross boundary collaboration and ad hoc groupings, which emerge spontaneously as members discover common areas of interest with a far wider group. Fluid structures could lead to uncertainty, which may increase perceptions of risk and lack of trust.

Furthermore, high ICT dependence could further challenge the notion of community as direct observation of the way fellow members behave is limited and this could inhibit sense of belonging and identity.

Geographical distance, time, culture and language differences challenge to the spirit of togetherness, which is vital for the establishment of a community ethos. Moreover, the capacity to engender a sense of belonging and common identity can be inhibited by cultural differences as they have an effect on basic communication between members including concepts such as, verbal, nonverbal behaviour, language, rites, beliefs and customs, as well as the role of gender in different cultures. Moreover, as Kiesler and Cummings, (2002) identified, there is also potential for dispersed members to pay less attention which increases the possibility of more freeriding with some actors taking advantage of the efforts of others without sufficient reciprocity.

9.4.1.4 Legitimate Peripheral Participation

Geographical distance, time, culture and language differences could affect the issues of safety and trust which are critical for developing a learning environment in within which new members can be socialised. Less social interaction means that new members have reduced opportunity to observe others in situ in a common context.

This could lead to misunderstandings due to lack of awareness of local context and failure to spot tacit knowledge elements. Reliance on ICT may reduce opportunity for interpreting subtle nuances associated with non-verbal cues, especially when giving and receiving feedback.

On the other hand, new wave collaborative technologies enable new members to benefit from access to wider networks and an inexhaustible source of on-line resources to aid learning without the need for a relationship with a 'master'.

The table below summarises the key implications.

Table 9.4.1. Summary of implications of virtual working by research themes. Developed by the author.	
Theme	Implications
Strength of Social Ties	<ul style="list-style-type: none"> • Reduces the significance of strong social ties • Enables beneficial new weak links to be established • Language differences can inhibit communication and make it difficult for people to work to form strong ties • With a complex problem people tend revert to greater collaboration with those in their tight-knit group
Practice	<ul style="list-style-type: none"> • Different national cultures lead to different ways of thinking feeling and behaving, which could inhibit the development of common ways of working • In virtual meetings language becomes the dominant factor • Conflict resolution more challenging as national identity and language can lead to different world views and associated misunderstandings and stereotyping and the inability to reach consensus • When members are spread across many locations knowledge sharing may be more difficult to achieve and there are less opportunities for informal collaboration and knowledge sharing
Community	<ul style="list-style-type: none"> • Could be challenged by cross boundary collaboration and ad hoc groupings, which emerge spontaneously as members discover common areas of interest with a far wider group • ICT dependence could challenge the community as direct observation of the way fellow members behave is limited and this could inhibit sense of belonging and identity • Potential for dispersed members to pay less attention which increases the possibility of more freeriding with some actors taking advantage of the efforts of others without sufficient reciprocity
LPP	<ul style="list-style-type: none"> • Less social interaction means that new members have reduced opportunity to observe others in situ in a common context • Reliance on ICT may reduce opportunity for interpreting subtle nuances associated with non-verbal cues, especially when giving and receiving feedback • New wave collaborative technologies enable new members to benefit from access to wider networks and an inexhaustible source of on-line resources to aid learning without the need for a relationship with a 'master'

9.5 Limitations and opportunities for future research

The findings of this research study should also be examined from the perspective of the limitations of the thesis. These are presented below and followed by opportunities for further research.

9.5.1 Data collection method

The research draws on virtual communities of practice based in organisations with global reach in the digital/IT sector and within which virtual working is prevalent. They each have varying degrees of virtuality and are all tasked with developing and delivering learning and development programmes to key stakeholders within inter and intra-organisational settings. The study deploys a qualitative case study design, with main units of analysis being three virtual communities of practice, selected using the purposive sampling approach.

This approach was adopted because it allowed the research to explore topics with a degree of breadth and enabled greater degree of flexibility in the data collection process. Data has been collected, using a qualitative approach, through semi-structured interviews conducted with members of the virtual communities of practice in the study. A potential limitation is that, clearly, it was only possible to gather data from those that participated who included both senior and less senior members of the virtual communities of practice. The data gathered from senior and less senior people enabled meaningful triangulation and its validation through cross verification. However, whilst this approach enabled breadth, the process of semi-structured interviewing does not allow for fine detailed data to be gathered and it is important to recognise that interviews with all members combined with an analysis of their social networks could potentially provide more detailed data.

9.5.2 Single point in time

A further potential limitation is that, for reasons of time constraints associated with the completion of a PhD thesis, the data was gathered on the basis of a single point in time.

An opportunity for further research in the future could be a longitudinal study to augment and extend the findings of this thesis, which could enable the future research to detect developments or changes in the findings of this study.

9.5.3 Generalisability

This study draws on communities of practice based in organisations in the digital/IT sector and within which virtual working is prevalent. These organisations include a multi-national corporation, a professional institution and an SME with global reach. More research into different types of communities of practice and in different sectors would clarify the extent to which these findings can be considered generalisable to other situations and settings.

9.5.4 Opportunities for further research

This study began in 2013 at a time when robotics had not made a significant impact on the way actors perceived the use of ICT in the work place. Now the issues associated with Artificial Intelligence and automation are increasingly featuring as a source of interest and concern, further highlighting the themes of ambiguity and complexity that have emerged from this study.

9.5.5 Possible future research questions

Since the findings of this study have indicated that digital connectivity and its implementation in communities of practice has had an affect on the power balance within organisations leading resentment and in some cases fear possible questions for further research could include:

- What are the implications of undermining the sense of community within organisations?
- How can organisations that operate globally continue to balance the value of diversity and weaker links created by virtuality working whilst at the same time maintaining the capacity for socially constructed learning?
- How can policy makers address the issue of resistance to the implementation of new ways of working?

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12. Appendix

12.1 Interview transcripts

<p>Elements of virtuality</p> <p>Virtual working means that one or more of the following elements are present: Distributed location, Dependence on ICT, Fluid Structure, Time differences, National and Language Diversity.</p> <ul style="list-style-type: none"> • Please can you comment on the implications of these from your perspective? 	<p>“All my work is UK based so the issues of time, national and language diversity do not impact on me except to the extent that Scotland, Wales and Northern Ireland are different parts of the UK and have their own distinct cultures and ways of working. Of course, all the other elements do apply. As I said earlier, the implications of distributed location are largely associated with the question of accessibility. With VW some people can hide and this can be frustrating and get in the way of sharing knowledge and solving problems. Especially, if there is a power imbalance. If one person feels they have more power than they may not respond for input so readily as say a new or less senior person.”</p> <p>“Improvements in technology reduce communication barriers. Finding ways to encourage people to interact is very important. People can zone out. Need to make good choice of which technology to use. Needs to be intuitive and easy to use. Videos are important as it increases band-width and richness of communication. Makes VW more real. Example of taking pictures and videos of</p>
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	<p>working environment because people could visualise it in other countries. Need to work harder on explaining the purpose of what we are doing with VW than when co-located. Clarity of roles, rigour in terms of agendas.”</p>
	<p>“We need to have a good awareness of different cultures. This means we should talk more slowly and clearly and avoid colloquialisms. We should be especially careful of humour, which can be misplaced and misinterpreted.”</p>
	<p>“Often the internet can be flaky and people have to adapt by using other methods to get in touch, such as their own mobile devices. This can cause frustration and sometimes people just opt out altogether from communicating in a virtual way.”</p>
	<p>“Technology plays a big part and recent developments make the virtual more real. Improvements in technology reduce communication barriers. It’s the enabler. VOIP, internet, PM tools and platforms. Slack, Skype, Base camp, Google docs, etc. Used to be only conference calls and emails. Can be alienating and isolating. Things too instant – can’t reflect for as long as maybe needed. Access to the global group is incredible helps to</p>

	<p>generate more innovation. Don't enjoy VW but have to do it because that is the way of working with global interactions. With more local interactions than look for opportunities for face to face."</p>
	<p>"Different cultures may well different norms around issues associated with trust – example is copyright of products. I also depends on the complexity of the issue which may be affected by use of language and cultural norms."</p>
	<p>"We need to be more mindful of issues that we take for granted when interacting face to face – e.g. non-verbal cues. Also means that it takes people longer to process information. Written information (asynchronous) is easier than when speaking. Especially if it is a complex issue. This needs mindful approach, as it can cause frustration."</p>
	<p>"We need to be a lot more careful about others and their sensibilities. Human beings are social animals. There is no one process that is ideal for any one. With VW we need to have an explicit agenda. The Issue of language is important. Thinking and talking at same time slows down the process the information. Especially if it is a more complex problem. Requires being a lot more</p>

	careful – can't walk into someone's office and say have you get 5 mins. Need be mindful of others sensibilities. Regular face-to-face and video meetings are needed."
	"Virtual working can make you feel more autonomous and this is very important to me"
	<p>"I work virtually full time and often on a global basis. This makes time zones very challenging – never a time that works for all."</p> <p>VW means you need to slow down, have to repeat and keep checking for understanding. This can be a cost of VW – especially in groups as opposed to 1:1. Have to work harder at the communication process."</p>
	"Accents can be very difficult sometimes. I have colleagues in India and I often have to ask people to repeat."
	"We need to really concentrate and focus as don't have visual cues - skype calls are often useful."
	"Need to have more regular break-outs with VW to keep energy levels high. Chat box are useful as opposed to verbal interactions for people with English as

	not their primary language.”
	“Improvements in technology reduce communication barriers. We need to make good choice of which technology to use and ensure that it’s intuitive and easy to use.”
	“Videos are important as they increase band-width and richness of communication and makes VW more like a face to face physical meeting.”
	“When working across national and cultural boundaries it’s very helpful to take pictures and videos of working environment so that people visualise their respective working settings.”
	“Virtual working means that we need to work harder on explaining the purpose of what we are doing than when co-located.”
	“Things like clarity of who is doing what and by when needs to be much more clear in virtual settings as does setting clear meeting agendas and sticking to them!”
	“With VW people feel pressure to respond instantly and this can lead to pressure and resentment. You have to be really sensitive as trust can be harder to

	build with different cultures.”
	“Trust is underpinned by opportunity to be face to face as this helps to minimise doubt so with VW this can be an issue.”
	“Need to get used to people working outside of working hours and accept informality more.”
	“Improvements in technology reduce communication barriers especially video and cameras.”
	“One of the major factors is that there is less talking over each other when we have virtual meetings. This means we can be more democratic, especially with chat boxes. This helps with people with less confidence. It’s also much faster and provides traceability in terms of who said what”.
	“The technology needs to be adopted by all and embraced so we are all on the same page. Also it needs to be stable otherwise it can be very frustrating.”
	“Strong ties really matter. It is easier to make progress and understand the other person if you have a strong relationship with them. If you know where they’re coming from it speeds things up as you don’t waste time trying to figure them

	<p>out.”</p> <p>“It is possible that things can be misunderstood and take words out of context. Have to very careful and give people more time to articulate. Trust can be harder to build with different cultures. Some people are less assertive and more passive so it can be difficult to really understand them and so when dealing with more complex projects we need to take greater care.”</p>
	<p>“Need to encourage people to develop social ties so it is not just about business. Need to have social interaction to develop social ties. Helps to generate better understanding of personal side of people.”</p>
	<p>“Perhaps VW enables contact with wider groups. So we can get information from others as well as those with whom we have strong ties. This is a major benefit of VW”</p>
	<p>“More collaborative tools – slack, google hangouts, docs, etc help to generate rapport and work closely with people who are remote”</p>
	<p>“In my view it is easier to have stronger relationships if you meet f2f on a regular basis. This helps to understand the other</p>

	person and helps them to understand you too.”
	“The absence of body language can mean that knowledge sharing can be more problematic with people you don’t know so well. On the other hand VW means the ability to be in contact with a much more diverse group of people than you can with co-location so this can aid the process of getting sharing ideas and thoughts with far more people.”
	“Technology can be really irritating if you can’t feel confident that it will work and you can rely on it.”
	“A major challenge of VW is the question of time differences which often mean that people work through the night or get up really early. This can leads to resentment and also to reduced effectiveness due to people not having enough sleep.”
	“VW means you have time differences and this can leads to reduced effectiveness due to people not having enough sleep. It is possible that things can be misunderstood and take words out of context. Also accents can be a challenge. Have to very careful and give people more time to speak. Also, need

	to be more mindful of the other's culture as trust can be harder to build."
	"Technology can be really irritating if you can't feel confident that it will work and you can rely on it. Having said that it is getting better and this is less of an issue – especially if you are a bit tech savvy."
	"One of things about technology is you need both formal imposed by the organisation and informal platforms which people set up on their own – eg Facebook, What's App. People can be more open and honest with the informal ones. Big brother syndrome. People prefer to use their own shadow, or subversive ones. Eg Skype, MS Link etc."
	"People need to be very aware of colloquialisms and jargon which do not translate very well – this can slow things down. Need to speak more plainly."
	"Time differences are critical. VW means you have time differences and this can lead to reduced effectiveness due to people not having enough sleep. Also accents can be a challenge. Have to be very careful and give people more time to speak."
	"The development of more collaborative 'emotional' technology is having a bigger

	impact on the richness of the communication.”
	“Time differences are critical. Working across time zones to coordinate meetings is one of the most challenging issues we face with VW. Important to use shared calendar that displays availability and automatically places the meeting in the time zone of each participant. “
	“Need to be very clear as it is possible for misunderstandings to occur and take things out of context. Need to be more aware of the other’s culture. Trust can be harder to build with different cultures. People need to speak more plainly.”
	“VW makes it harder to gain understanding of each other’s perspectives. Body language and eye contact is missing. This makes it harder to understand each other and can be very frustrating. Need to work harder on explaining the purpose of what we are doing with VW than when co-located.”
	“Often the internet can be unstable and people have to adapt by using other methods to get in touch, such as their own mobile devices. This can cause

	frustration”
	<p>“Temporary nature can help because can get down to work straight away rather than engaging in social chit chat.</p> <p>Motivation to interact is more related to the task or the work rather than in relationship.”</p>
	<p>“Improvements in technology reduce communication barriers and make it possible to reach people in far-flung places. Skype, Slack gives you the ability to keep it for audit trail of all communication. Helps to limit sense of alienating and brings smart people together. Don’t need to be so tech savvy as technology is now so much more intuitive and easy to use.”</p>
	<p>“The most challenging is the time difference issue. Need to respect people and not have same people work in the evening or early morning.”</p>
	<p>“Complexity of issue may be affected by use of language and cultural norms.</p> <p>Takes people longer to process information. Written information (asynchronous) is easier than when speaking. Especially if it is a complex issue. This needs mindful approach and can cause frustration. Issue of language</p>

	<p>is important. Thinking and talking at same time slows down the process the information. Need to be more enquiring and probing rather than demanding. Especially if it is a more complex problem. Requires being a lot more careful and mindful. Culture has a huge part to play. Also can feel alienating and isolated. Need to articulate and schedule touch points and contact spontaneously.”</p>
	<p>“It is possible that things can be misunderstood and take things out of context. Have to very careful with some people are less assertive and more passive so it can be difficult to really understand them and so when dealing with more complex projects we need to take greater care. Language can be problematic and can prevent barriers to communication especially if there is different mastery of language. Can lose a lot of the non-verbal component of interaction. Also people can be more self-conscious of how they look so do not like video calls.”</p>
	<p>“If technology fails it can be a problem so need to have multiple touch points and different ways of contacting.”</p>
	<p>“Things can be too instant – can’t reflect</p>

	for as long as maybe needed.”
	"It is more difficult to get alignment if you don't meet regularly. VW means that you are one dimensional in interaction and this can lead to gaps. F2f can strengthen trust. Lack of understanding of the context can leads to misunderstandings especially in different cultural contexts.”
<p>Social Ties</p> <p><i>In what ways does virtual working effect the importance of strong social ties in CoPs?</i></p> <ul style="list-style-type: none"> <i>In your view and based on your experience how important is it to have a good relationship with those you work with virtually?</i> <i>If you think that you don't need to have strong ties then are weak ties OK for Virtual working?</i> 	<p><i>“It is very important. Just as it is when working in a co-located way. People feel more comfortable to share their ideas when they feel that they can trust those they interact with. Having said that, I think that it is quite possible to have less in-depth knowledge of someone when working virtually and still have a successful relationship.”</i></p> <p><i>“Well, you may not need to know someone for very long or to be in contact with them every day to be able to work virtually with them. You just need to know enough about them.”</i></p> <p><i>“The sorts of things that I feel are important are, what do I know about them? Can I trust them based on their reputation? What they have done in the past? Do they have the</i></p>

	<p><i>knowledge and expertise needed for the work in hand? Are they accessible and approachable? These are very important elements too and possibly more so than having a strong tie with them. I am not saying that good relationships are not important it's just that I don't think you need to know someone really closely in order to make virtual working effective."</i></p>
	<p><i>"People relationships are very important. We need to remember that Body language elements are missing. It is very important. Just as it is when working in a co-located way. People feel more comfortable to share their ideas when they feel that they can trust those they interact with. Having said that, I think that it is quite possible to have less in-depth knowledge of someone when working virtually and still have a successful relationship. "</i></p>
	<p><i>"It depends on the nature of the relationship. Internal, external, suppliers, clients? By working virtually we are able to generate new solutions. Relationships are very important. People need to share the end in mind in order to collaborate and participate in VW. Need to share</i></p>

	<p><i>the same objectives. It's all about clarity of purpose and desire to make it happen. Senior managers need to make it clear that this is needed and people need to be aligned with that. Coalescing around objectives. If you don't know them personally then trust in colleagues is easier if you belong to the same group and have a reason to associate with each other. People feel more comfortable to share their ideas when they feel that they can trust those they interact with. Possible to have less in-depth knowledge of someone when working virtually and still have a successful relationship if you can find some way of trusting him or her. I am not saying that good relationships are not important it's just that I don't think you need to know someone really closely in order to make virtual working effective."</i></p>
	<p><i>"You need to know what people can do – need to know their skills. Trust their competence."</i></p> <p><i>"People feel more comfortable to share their ideas when they feel that they have initially met."</i></p>
	<p><i>"Some people are more comfortable when VW due to being less extroverted. Good relationships are</i></p>

	<p><i>important, it's just virtual working means you can work together without being physically together."</i></p>
	<p><i>"I am an extrovert and feel that face to face promotes innovation. However, when you co-habit frequently you can get a bit stale. Having people in wider virtual group can freshen up knowledge creation. You need hybrid approach to get a better result. VW and co-location need to go together. VW exposes you to more information from people you don't know so well. VW enables more introverted people to make a better contribution, but needs good chair and explicit agenda. People need to be mindful. VW make help people feel more comfortable to share their ideas if chair is good. Combination of face to face and vw is best – hybrid, is best for good relationships. VW is great to enable space to generate creativity and innovation due to access to wider range of people and skills with people with whom we have less deep relationships and this may be a downside. Therefore, a hybrid approach may be best."</i></p>
	<p><i>"VW does not require co-location, so can lead to sense of isolation which can be very difficult. So, relationships</i></p>

	<p><i>are important just as it is when working in a co-located way. People feel more comfortable to share their ideas when they feel connected and that they can trust those they interact with.”</i></p>
	<p><i>“Well, the sorts of things that I feel are important are, what do I know about them? Can I trust them based on their reputation? What they have done in the past? Do they have the knowledge and expertise needed for the work in hand? Are they accessible and approachable? These are very important elements too and possibly more so than having a strong tie with them.</i></p>
	<p><i>“Strong ties are important. Having said that, sometimes brainstorming works best with VW as you don’t know people. I think that it is quite possible to have less in-depth knowledge of someone when working virtually and still have a successful relationship.”</i></p>
	<p><i>“Knowing people less well can allow access to new and fresh ideas.”</i></p>
	<p><i>“Social ties need to be strong. People relationships can grow as a result of VW but we need to meet physically</i></p>

	<p><i>from time to time.”</i></p> <p><i>“People feel more comfortable to share their ideas when they feel that they can trust others, so relationships are important.”</i></p>
	<p><i>“We also need to be open to other people too to get input of ideas and collaboration with diverse groups.”</i></p>
	<p><i>“With VW we need to be more disciplined and have more explicit rules and more structures to help us be more innovative with people we don’t see that often, if at all!”</i></p>
	<p><i>“I think that it is quite possible to have less in-depth knowledge of someone when working virtually and still have a successful relationship which grows afterwards”</i></p>
	<p><i>“It’s important to have diversity of people - so we need to include those with whom we may not have a long standing relationship. This helps to keep the ideas fresh and new.”</i></p>
	<p><i>“We don’t know what we don’t know so we need to be careful that we don’t get complacent and live in an echo chamber. This is a major benefit of VW”</i></p>
	<p><i>“I am not saying that good</i></p>

	<i>relationships are not important it's just that I don't think you need to know someone really closely in order to make VW effective."</i>
	<i>"Strong ties are more important in VW because so many things than can go wrong. For example, because Body language elements are missing you can never be entirely sure how other people are responding."</i>
	<i>"Just as it is when working in a co-located way, people feel more comfortable to share their ideas when they feel that they can trust those they interact with."</i>
	<i>"I make a great effort to encourage people to develop social ties so it is not just about business when we interact either on line or face to face. For example, we celebrate birthdays and look for some kind of shared activity which can be participated in and discussed on line. This sets up a bit of banter opportunities and helps to generate better understanding of personal side of people. Without this the effect is we are only here to work and can lead to sense of isolation and alienation associated with VW."</i>
	<i>"The issue of trust is very important in VW. It is easier to make progress and</i>

	<p><i>understand the other person if you have a strong relationship with them. Need to encourage people to develop social ties as this provides basis for better understanding of where the other person is coming from.”</i></p>
	<p><i>“This is an interesting point, especially as it links to the question of trust. It is more straightforward if you have a strong relationship with them as this provides basis for better understanding of others”</i></p>
	<p><i>“Because VW means lack of body language and nuances of communication can be missing then it may mean that knowledge sharing can be more problematic with people you don’t know so well.”</i></p>
	<p><i>“Trust is the most important thing here and without a good relationship it is difficult to generate a sense of trust. It is easier to have stronger relationships if you meet f2f occasionally”</i></p>
	<p><i>“With VW you contact wider and more diverse groups of people so this can help to find better solutions to problems. This leads to better sharing of ideas and thoughts than you can with co-location”</i></p>

	<p><i>“Most of the message comes though non-verbal cues so the absence of these can mean that knowledge sharing can be more difficult if you don’t know the other person and they don’t know you very well”</i></p>
	<p><i>“From my experience VW works very well. Where it becomes more a challenge is when objectives are not shared. If people are not motivated and if people do not share purpose so getting closer to people is important and social element is needed to overcome issues. If people don’t have strong social ties means that there can be less commitment. “</i></p>
	<p><i>“The importance of these social interactions need to be recognised and formally articulated.”</i></p>
	<p><i>“Reciprocity can be only with those with whom social ties are stronger. People can form coalitions with those they know best and with whom they have a stronger relationship”</i></p>
	<p><i>“If people don’t have strong social ties means that there can be less commitment and less trust. Trust enables cooperation, encourages information sharing, and increases openness and mutual acceptance.</i></p>

	<p><i>This means that good relationships are very important. “</i></p>
	<p><i>“It is possible to develop relationships which can be sustained as a result of working together in a virtual way. I think that it is quite possible to have less in-depth knowledge of someone when working virtually and still have a successful relationship which grows afterwards. There are benefits which can come from being able to reach a wider more diverse group of people than you can when co-located.”</i></p>
	<p><i>“Trust at work is critical, but it can be difficult to pin down and address. If people are not motivated and if people do not share purpose so getting closer to people is important and social element is needed to overcome issues.”</i></p>
	<p><i>“It depends on whether there is f2f. People don’t need to see each other every day. But do need to refresh relationships with occasional f2f as time goes by. Strong ties really matter. But sometimes people can be taken for granted and taken advantage of when there are strong ties. Sometimes if you don’t know them so well you may go the extra mile. It is easier to make progress</i></p>

	<p><i>and understand the other person if you have trust with them. People feel more comfortable to share their ideas when they feel that they can trust others.”</i></p>
	<p><i>“Autonomy is an important issue and some people are turned off by attempts to generate team spirit. Some people don’t like idle chit chat. Some people are introverted and don’t like these things. People should not be forced to go through team building efforts. More important to focus on tasks and the relationships will flow from there.”</i></p>
	<p><i>“People need to have EQ to have self and social awareness. Good VW means people need to coalesce around a task and purpose and then relationships flow from there. With introverted types there is less need to focus on the social side.”</i></p>
	<p><i>“People need to feel autonomous, have a sense of purpose and develop mastery so that VW does not lead to sense of isolation and alienation. VW enables contact with wider groups. So we can get information from others as well as those with whom we have strong ties. This is a major benefit of VW. I am not saying that</i></p>

	<i>good relationships are not important it's just that I don't think you need to know someone really closely in order to make VW effective.</i>
	<i>"People relationships are very important. F2F can't be beaten. Although with younger people on-line relationships are easier to establish."</i>
	<i>"Well, you may not need to know someone for very long or to be in contact with them every day to be able to work virtually with them. You just need to know enough about them. I think that it is quite possible to have less in-depth knowledge of someone when working virtually and still have a successful relationship."</i>
	<i>"Weak ties are useful especially with temporary projects as I feel we can get to the matter in hand in a more direct way."</i>
	<i>"With VW, the sorts of things that I feel are important are trust based on their reputation and the knowledge and expertise needed for the work in hand. These are very important elements too and possibly more so than having a strong tie with them."</i>
	<i>"No need to meet physically to be able to work together well. Social</i>

	<p><i>relationships grow means that we can work better together, expand the nature of work, and improve the way we work.”</i></p>
	<p><i>“Also like to have fun and helps to grow relationships so we can build trust and have a deeper level of collaboration. This means we become more innovative. This process is quicker in f2f situations so use a lot of skype if physical meeting not possible.”</i></p>
	<p><i>“As always it depends on the context – you may need to listen to people from the outside the group because their knowledge may be of value and can add to what we know rather than just to replicate it.”</i></p>
	<p><i>“Strong relationships are crucial and sometimes have to be fostered and maybe even forced when working virtually. Especially on a short-term project and cross-cultural and cross-national. Need to feel connected. Less social interactions with VW. Have to force opportunities to recreate the water fountain scenario. Have to be more rigorous about making this happen so people can learn from each other and promotes innovation.”</i></p>

	<p><i>“Having people in wider virtual group can freshen up knowledge creation. Sharing of tacit knowledge is more challenging. Need to use the technology and codify it so it is more easily accessible. Web casts are most useful. VW exposes you to more information from people you don’t know so well. VW is great to enable space to generate creativity and innovation due to access to wider range of people and skills with people with whom we have less deep relationships and this may be a downside. KM can be an issue and need to be more mindful of how to bring knowledge to the table.”</i></p>
	<p><i>“It is important we don’t get complacent and only relate with people we know and VW helps with this. This is a major benefit of VW. Although, need to be aware of jargon and ‘code’ when interacting with people outside our group.”</i></p>
	<p><i>“Well this is an interesting point, especially as it links to the question of trust. It is more straightforward if you have a strong relationship with them.”</i></p>
	<p><i>“The less well you know someone you need more formality and you need to be take more care. Perhaps</i></p>

	<i>less emotional and more 'business' like."</i>
	<i>"People feel more comfortable to share their ideas when they feel that they can trust those they interact with."</i>
	<i>"Need to build in opportunities for social interaction – google hangout video – share jokes and stories. Instant messaging helps to 'chat'. Social ties lead to trust, easier to have difficult conversations because you have understanding of each other. Know other people interests. Rapport is important."</i>
	<i>"VW means you must be more explicit about agenda and keep things less open ended. Important to keep on track and therefore need to be less spontaneous. This can inhibit social interaction – due to need to stick to task due to time pressure. Meetings are shorter and more concise."</i>
	<i>"VW can mean optional participation. Easier for people to lurk and free-ride."</i>

<p>In what ways does the degree of virtuality impact on the socialisation new members in VCoPs?</p> <ul style="list-style-type: none"> • What's your view on how VW impacts on how new people can be brought up to speed when they join the group? 	<p>"Depends on how many join at once. Easier to absorb smaller number. Need norms and identity to better defined to assist process of assimilation. Co-located groups are quicker to assimilate new members due to picking up stuff by osmosis. Can pick up the non-verbal cues better. Need to be more explicit when using VW as lack of non-verbal cues are multiplied by distributed location, dependence on ICT, Fluid Structure, Time differences, National and Language Diversity. Feedback is especially challenging with VW as well as the context of the situation."</p>
	<p>"New members need to learn more quickly. Need to listen, do the reading necessary because the non-verbal cues missing. Need to be have very good documentation, which is more explicit. VW means lack of non-verbal cues are multiplied by VW."</p>
	<p>"With junior members VW is very difficult. There is a great need to keep people on track especially when they are younger and help them to learn from mistakes but not allow the mistakes to do harm. So need to keep eye on them and encourage their enthusiasm. VW means we need to be have very good documentation and manuals, etc."</p>

	<p>“Culture and values and knowing are very important and cannot be engrained virtually which means that VW makes this a real challenge.”</p>
	<p>“Not a good idea to on-board people with VW – success ratio would be a lot less as we need to keep eye on them and encourage their enthusiasm.”</p>
	<p>“Difficult to integrate new people when you don’t meet them –can’t hug with VW, the physical element is very important for bonding and socialisation.”</p>
	<p>“Co-located groups are quicker at getting new members up to speed.”</p>
	<p>“It’s important to be more direct and explicit when using VW to assimilate new members due to the absence of visual cues which help us to pick stuff up by osmosis.” “Feedback is especially challenging with VW as well as the context of the situation.”</p>
	<p>“Language is definitely a factor. You have to be really sensitive, especially with new members. Need to pick up on accents. Only so many times you can ask people to repeat. Use of chat box features are most helpful.”</p> <p>“Hofstede analysis is very important and awareness of different cultures need to be made more explicit. I find I have to talk</p>

	more slowly and clearly and avoid colloquialisms as people can take words out of context.”
	“You have to very careful and give new people more time to articulate especially when dealing with something business critical and more complex projects where we need to take even greater care.”
	“People need to be more proactive and I find that appointing a ‘buddy’ to aid process of assimilation can be very helpful.”
	“Co-located groups are quicker to assimilate new members as observation and simulation are easier to achieve”
	“This can very difficult and having f2f meetings at first can aid the process. If this not possible then people need to take the initiative and more explicit when using VW as lack of non-verbal cues are magnified by VW language differences. Need to schedule meetings more formally because lack of chance meetings opportunity.”
	“It is possible that things can be misunderstood and take words out of context. Have to very careful and give people more time to articulate. Trust can be harder to build with different cultures. When dealing with something business

	critical and more complex projects we need to take greater care.”
	“Social interaction inhibited as people have reduced opportunity to observe others in situ. Could lead to misunderstandings due to lack of awareness of local context and failure to spot tacit knowledge elements.”
	“Need to be more explicit when using VW as lack of non-verbal cues are magnified by VW language differences”
	“People tend to be socialised by those around them in a physical sense, so VW makes this more difficult.”
	“VW can impact on new hires as it takes longer to build relationships. This is because people tend to be socialised by those around them in a physical sense, so VW makes this more difficult. F2f meetings to begin with can really help .Buddy is necessary – and it is important that the buddy spends f2f time with the new hire. This is due to the tacit knowledge elements which are difficult to convey in a codified way.”
	“Need to spend f2f time with the new people so they can pick up things from observing and being observed”
	“We have a buddy system and spend f2f time with the new people. This enables

	people to operate together as a single unit so that they are able to monitor and help each other and give and receive feedback more easily. This can help learning to be transferred effectively.”
	“VW often can mean ‘out of sight, out of mind’ so we need to connect on a regular basis especially in first weeks, in order to establish a pattern and rhythm of staying in touch. Need to make sure new member is clear on priorities. When things become established, contact can be less frequent depending on the nature of the tasks at hand.”
	“This is a challenge. This can very difficult and having f2f meetings at beginning can aid the process. Extra clarity of what is acceptable. Turn unwritten rules into written rules. People need to take the initiative and more explicit when using VW as lack of non-verbal cues are magnified by VW. Needs more clarification and codification. Need to schedule things more formally because lack of chance meetings opportunity.”
	“Need to work harder on explaining the purpose of what we are doing with VW than when co-located. Clarity of roles, rigour in terms of agendas”
	“Need norms and identity to better

	defined to assist process of assimilation.”
	“Nowadays we learn on a need to know basis. So we can learn from web-sites. EG Stack overflow. Experts codify their knowledge and you can access this. You can then ask questions and grow knowledge and then become master and teach other. This is great for knowledge that is explicit but less so with implicit and tacit side of things.”
	“Without f2f meetings we need to have personal contact and keep building the bridges with each other”
	“Need to make information more explicit and written down. Culture and values and knowing are very important and cannot be engrained virtually. Simple tasks are different, more deep-seated things that need embedding and instilling are more difficult with VW, Not a good idea to on-board people with VW – success ratio would be a lot less. With junior members VW is very difficult”
	“Subtle nuances can be missing in VW – therefore need to have hybridity to overcome this. VW means that you can lose improvisation and informal spontaneous interactions. This can be a cost of VW. People can feel isolated and then maybe leave the group. Feedback is more problematic with VW so again need

	<p>to be more rigorous and establish a habit of doing this. Buddy system can be good – need more overt and more structured than in non-virtual environment.”</p>
	<p>“People tend to be socialised by those around them in a physical sense, so VW makes this more difficult. F2f meetings to begin with can really help. Need to have documents ready to help them to assimilate and to give them an induction process. Because there is less reduced chance to see other people in the work context it could lead to misunderstandings due to lack of awareness of local context”</p>
	<p>“VW makes this more difficult. Need to consider other people and not be so interested in your own agenda.”</p>

<p>Effects on Practice</p> <ul style="list-style-type: none"> What does VW do to the development of the ways of working? 	<p>“Subtle nuances can be missing in VW – therefore need to have hybridity to overcome this.”</p>
	<p>“Simple tasks are different, more deep-seated things that need embedding and instilling are more difficult with VW.”</p>
	<p>“I think it slows things down because many new ways of working spring out of spontaneous water cooler type meetings, which are difficult to simulate with VW. “</p>
	<p>“Out of sight out of mind syndrome can lead to people being perceived as free-rider rather than a giver.”</p>
	<p>“Clear and explicit vision and mission are critical.”</p> <p>“We need to have higher degree of formality and more explicit ways of articulating what needs to be done.”</p>
	<p>“It’s very important to find ways of encouraging the social side of things too.”</p>
	<p>“Need to be suspend beliefs and values of the other culture and be aware of own cultural bias. Emotional Intelligence plays a major part of this. We all need an increased capacity to be more self-aware and to be open to self- reflection. I believe we all need to process our own self-talk and be aware that some may reject ideas that</p>

	don't fit our own cultural norms. E.g. – Sweden culture – (collective) v Latin America (individualistic).”
	“With virtual working you can include a wider group of people so it makes it possible to develop more innovative solutions to problems and improvements in how we operate”
	“Because we can reach wider group of people this can be helpful to creativity because more likely to have access to new knowledge from wider group than from a co-located group which has been working together for a long time and has close relationships. Use of collaboration technologies – slack, face time, Skype, Link, google docs, hangouts, etc are very helpful.”
	“The absence of the opportunities for chance meetings means that spontaneity is reduced and this can inhibit creativity”
	“Because there is reduced chance to see other people in the work context it could lead to misunderstandings due to lack of awareness of local context and failure to spot tacit knowledge elements. On the other hand, there are benefits which can come from being able to reach a wider more diverse group of people than you can

	<p>when co-located. This can lead to more creative solutions. Improvisation is a key factor in knowledge generation and is likely to be limited when ICT dependence is high, although Slack, face time, Skype, Link, google docs, hangouts, etc are very helpful in overcoming some of the issues.”</p>
	<p>“Easy for misunderstandings to occur. Information means most when things are seen in context and least when not in context. Also, failure to spot tacit knowledge elements can mean knowledge sharing is not effective.”</p>
	<p>“Need to ensure reciprocity otherwise community can fragment and new groups form. Size of group is much bigger with VW. Depends on terms of reference. Can reach people we don’t need to know as long as we can get their inputs.”</p>
	<p>“VW enables a period of time to consider things better and to encode and decode language. This could be better than f2f as people who don’t have good language can take more time and not feel under pressure to respond. There is a danger that those with less mastery of the language can be left behind and their contribution not taken on board. Can take words out of context. Have to very careful and give people more</p>

	time to articulate.”
	“VW makes it harder to include people who have lower language skills and need to take more time. Needs to be more structured dialogue at the start.”
	“Tutorials and web based resources can aid the development of the practice – up to a point when tacit knowledge is needed”
	“The absence of the opportunities for chance meetings means that spontaneity can be reduced and this can impact on creativity.”
	“Access to the culturally diverse & global groups helps to generate more innovation.”

<p>Effects on Community</p> <ul style="list-style-type: none"> What's your view on how VW impacts on the sense of togetherness and team spirit? 	<p>"Can feel part of community as long as occasional face-to-face meetings take place. If never meet than its difficult o be a community. Maybe more of a network. Also, the fact that people are in different places makes it difficult to generate the sense of togetherness – especially as social gatherings are limited."</p>
	<p>"I believe that it's quite possible that people may pay less attention with VW and some may free- ride as a result. This can be very annoying and may cause people to feel left out of the group. Also, the fact that people are in different places makes it difficult to generate the sense of togetherness – especially as social gatherings are limited."</p>
	<p>"Need to make sure we share personal information to help to feel part of community – also need to have occasional face-to-face meetings take place. If never meet than it's difficult to be a community."</p>
	<p>"Difficult to integrate with people who don't meet and develop a sense of cohesiveness and engagement. This is often because social element is missing. This can be very frustrating, may cause people to feel left out, and isolated. When you break bread you make bonds."</p>
	<p>"It's important to remember that non-</p>

	verbal cues are missing and this can lead to isolation.”
	“The fact that people are in different places makes it difficult to generate the sense of togetherness – especially as social gatherings are limited.”
	“Because opportunities for physical get togethers are reduced, it makes it more challenging to feel like we’re a community.”
	“I guess we all need to be more pragmatic and accept that people can blur the edges between working and social life especially when working out of hours due to time differences.”
	“VW could lead to uncertainty about the group, which could lead to risk of lack of trust. When people have no history and no future together this may inhibit confidence in the degree of reciprocity that exists.”
	“VW can lead to a sense of isolation and may inhibit confidence in others and trust building can be more difficult”
	“VW means you are missing the physical connection and can lead to a sense of alienation and isolation, especially when working outside of normal hours and the work – life balance is missing”

	<p>“VW limits direct contact with fellow members and this could inhibit sense of belonging and identity. Could also impact on the way in which tacit knowledge is shared. “</p>
	<p>“Single most important thing is the challenge of getting this sense of togetherness. Need to be more mindful of others people personal interests. Social interaction needs more effort required. Formal nurturing of informality is needed.”</p>
	<p>“Celebration is key to this and not so easy with VW.”</p>
	<p>“If the passion for the task or purpose is shared with the other group members and share the knowledge then you do feel connected. Maybe Community is more related to co-location, VW is may be too fluid for ‘Community’.”</p>
	<p>“Need to recognise people for good work and make sure we share personal information to help to feel part of community – also need to have occasional face-to-face meetings take place. If never meet than it’s difficult to be a community. Need to take more time to do this, especially as people can feel isolated. Good technology is critical – otherwise it can be frustrating. Improvements in technology can aid this process. Loss of</p>

	<p>spontaneous interactions can also affect this. Also VW means you get self- reliance and autonomous so can impact sense of community.”</p>
	<p>“If trust exists than can feel a better community and especially if we overcome problems together as this can help to form stronger bond.”</p>
	<p>If never meet than its difficult to be a community. Maybe more of a network. Also, the fact that people are in different places makes it difficult to generate the sense of togetherness – especially as social gatherings are limited. What I’ve seen in digital industries is that people to get together to ‘meet-up’ based on their specialism – e.g. PM, developers, - transferring from digital groups. They feel a sense of community associated with their interests. “</p>